
DEPARTMENT OF THE ARMY
EUROPEAN DIVISION CORPS OF ENGINEERS

**ENERGY ENGINEERING ANALYSIS PROGRAM
EUROPE**

**VILSECK MILITARY SUBCOMMUNITY
SEVENTH ARMY TRAINING COMMAND
WEST GERMANY**

**Final Submittal
VOLUME I
EXECUTIVE SUMMARY**

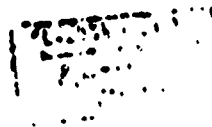
UNITED STATES ARMY
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FY 80 ENERGY ENGINEERING ANALYSIS PROGRAM, EUROPE

FINAL SUBMITTAL

FEBRUARY 1983

THE FINAL SUBMITTAL CONSISTS OF TWO SEPARATE VOLUMES:

- O VOLUME I EXECUTIVE SUMMARY
- O VOLUME II ENERGY REPORT

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FY 80 ENERGY ENGINEERING ANALYSIS PROGRAM, EUROPE

VILSECK

FINAL SUBMITTAL

VOLUME I

EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

VILSECK

1. INTRODUCTION

The Energy Engineering Analysis Program for the three U. S. Military Subcommunities of Vilseck, Hohenfels and Vilseck in West Germany, has been authorized by the Department of the Army European Division, Corps of Engineers under Contract No. DACA90-80-C-0093 dated September 29, 1980, and subsequent Modifications:

POC001 dated April 27, 1981,
POC002 dated September 29, 1981, and
POC003 dated September 30, 1981.

1.1 OBJECTIVES OF THE ENERGY STUDY

The objectives of this contract, as explained in detail in Schedule of Title I Services for Energy Engineering Analysis Program, Europe dated September 18, 1981, are as follows:

- a. Develop a systematic plan of projects that will result in the reduction of energy consumption in compliance with the objectives set forth in the Army Facilities Energy Plan.
- b. Use and incorporate applicable data and results of related studies, past and current, as feasible.
- c. Develop a coordinated basewide energy study.
- d. Prepare Program Development Brochures (PDB), DD Form 1391, and supporting documentation for feasible energy conservation projects.
- e. Include all methods of energy conservation which are practical (in so far as the state-of-the-art is reasonably firm) and economically feasible in accordance with guidance given.
- f. List and prioritize all recommended energy conservation projects.

1.2 INCREMENTS OF WORK

The work to be performed under the contract has been divided into four Increments: A, B, F and G.

Increment A - Energy conservation investigations for buildings and processes.

Increment B - Energy conservation investigations of utilities and energy distribution systems, Energy Monitoring and Control Systems (EMCS), and existing energy plant investigations.

Increment F - Facilities Engineer conservation measures.

Increment G - Projects identified in Increments A and B that do not meet the ECIP criteria of $E/C > 13$, but may qualify as OMA or MMCA Projects.

1.3 PHASES OF WORK

Increments A, B, F and G have been divided into three phases of work:

Phase I Data gathering and field trips.

Phase II Analysis of data, identification of potential projects, performance of feasibility and economic studies, and preparation of first page of DD Form 1391.

During this phase, all potential projects which produce energy and/or dollar savings should be identified and evaluated as to technical and economic feasibility.

Projects determined to be technically and economically feasible shall be combined into projects and ranked according to highest E/C ratio.

For FY 84, the minimum $E/C = 13$ MBtu/K\$

Phase III Preparation of DD Form 1391 and Project Development Brochures (PDBs); and preparation of documents presenting the results and recommendations of the study.

DD Forms 1391 and PDB's are not required for Increment F.

As a result of Modifications P00002 dated 29 September 1981, and P00003 dated November 2, 1981, it was negotiated that the Interim Submittal would not contain the Phase II effort of the EMCS study, nor the Phase I and Phase II efforts of Increment F. These would be included in the Preliminary Submittal, after additional required data is obtained by surveying all three subcommunities in early 1982.

1.4 PRESENT STATUS OF THE PROJECT

1.4.1 SURVEY

Prior to the commencement of Phase I of the project, a meeting was held between the A-E and the Corps of Engineers, and out of the approximately 160 energy consuming buildings at Vilseck, 61 buildings were selected to be surveyed in detail.

It was agreed that the sample selected was representative of the entire community; and that the results of the survey and subsequent analysis of energy consumption and energy savings based on a representative building per type at each community could be extrapolated to obtain the energy consumption, energy savings and implementation cost for the entire community, based on the total square foot area of all buildings of each given type.

By this extrapolation method, values of basewide energy consumption, energy savings, and implementation costs could be estimated; and basewide ECLP projects determined.

1.4.2 PRELIMINARY SUBMITTAL

The work listed below was accomplished and presented in the Preliminary Submittal:

- a. Compilation and analysis of the data and information received from each subcommunity.
- b. Review of the actual energy consumption of each subcommunity based on the energy consumption data collected; as well as a presentation of the projected energy consumption goals for each subcommunity based on the Army Facilities Energy Plan.

- c. Summarized tabulations of the survey data.
- d. Data of the surveyed buildings was input on Computer Program AXCESS.
- e. As a "sample-pilot" ECIP analysis, one building type was selected and analyzed for energy conservation in detail.
- f. The feasibility of Central Boiler Plant Projects was investigated.

The presentation of the Preliminary Submittal for Vilseck was made on 10 July, 1981 at Grafenwoehr.

Review comments on the Preliminary Submittal were forwarded to the AE by the Project Manager in his letter dated 15 October, 1981.

1.4.3 INTERIM SUBMITTAL

The work listed below was accomplished and presented in the Interim Submittal:

- a. The data received from the Subcommunity was updated.
- b. Review of the actual energy consumption of the Subcommunity based on the energy consumption data collected; and a presentation of the energy consumption goals for the Subcommunity based on the Army Facilities Energy Plan.
- c. We presented an updated list of the representative buildings of each type selected for detailed energy conservation analysis.
- d. The Computer Program AXCESS was used to model and analyze all the buildings surveyed at the Subcommunity. Quantitative results of monthly energy consumption for space heating, domestic hot water, lighting and miscellaneous electricity usage has been obtained for each type of building.
- e. Increment A: Each of the buildings types was analyzed for energy conservation opportunities (ECOs) that involved modifying, improving or retrofitting the architectural features, HVAC systems, plumbing systems and lighting.

ECOs determined to be technically and economically feasible (E/C>13, B/C>1) were combined into Energy Conservation Projects (ECP's), and extrapolated to Energy Conservation Investment Projects (ECIP's).

- f. Increment G: Projects considered in Increment A that did not meet the E/C>13 criteria and yet had a B/C>1 were recommended for implementation under OMA or HMCA funding.

A complete DD Form 1391 and complete PDS-I were presented for approval.

DD Form 1391s and PDSs are not required for Increment F.

- g. Increment B: Information obtained on utilities and energy distribution systems, and existing energy plants (boilers) was presented and possible energy conservation measures analyzed.

1.4.4 MODIFICATIONS #00002 AND #00003

These two modifications were negotiated and signed in September 1981.

It was agreed that the AE would perform a walk-through survey of every building in the community for Increment F's requirement to "provide recommendations for modifications and changes in system operation which are within the Facilities Engineer funding authority and management control", as well as for Increment B's EMCS analysis.

Only buildings larger than 5,000 GSF in area and consuming greater than 7500 gal/yr. of oil or 45 m-ton of coal or having a minimum 10 kw connected electrical load would be analyzed for EMCS feasibility.

The survey effort would be performed in early 1982.

1.4.5 PRELIMINARY SUBMITTAL, INCREMENT F

157 sets of field survey forms were reviewed and from these a computer input sheet for each building surveyed was prepared. A computer data library was created storing all information gathered in the field which could be relevant to recommendations under investigation.

Tables 6-1 and 6-2 of Volume 2, the Energy Report, list the relevant data.

Computer aided manual calculations were used to obtain unescalated energy and cost savings and implementation costs. A computerized economic analysis program was used to produce E/C and B/C ratios.

Recent American and German Manufacturer's catalog data was obtained and included in the Appendices, Volume 7 of the Preliminary Submittal.

1.4.5.1 RECOMMENDATIONS

All recommended energy conserving modifications were presented in Sections 7 and 8 of the Increment F Narrative, Preliminary Submittal. These sections are new Sections 8.7 and 8.8 of Volume 2, Energy Report.

A summary sheet for each Section 7 recommendations (Modification to Building Systems) includes the following:

- a. A brief description of reasons for the modification.
- b. Instructions for accomplishing the modification.
- c. An estimate of labor and material costs.
- d. An estimate of man-hours listed by trade, where relevant.
- e. The estimated dollar and energy savings.
- f. The results of an economic analysis: E/C AND B/C ratios.

The analyses of Section 8 recommendations (Modifications to M/O Systems) are contained within the Increment F Narrative, Preliminary Submittal.

A Summary of all modifications for Increment F listing costs, man-hours, dollar and energy savings was prepared and is presented in Table 2-1 of the Increment F Narrative, Preliminary Submittal. A copy can be found in Section 4 of this Volume. The Table lists the modifications in order from highest to lowest E/C ratio.

All energy conserving projects from Increments A, B and G and recommendations from Increment F have been consolidated, priority ranked and presented in Table 10-1 of the Increment F Narrative. Order of priority is from highest to lowest I/C ratio. A copy can be found at the end of this section.

Energy related areas of operation for which additional training of Facilities Engineering personnel is recommended has been listed in Section 12 of the Increment F Narrative.

Expendable equipment which should be changed to higher efficiency types when the next replacement occurs has been investigated. Recommendations are included in Section 13 of the Increment F Narrative, Prefinal Submittal.

1.4.6 PREFINAL SUBMITTAL, INCREMENT B

Work listed below was accomplished and submitted for Increment B, excluding EMCS:

- a. We have obtained information on and studied in significant detail the subcommunities electrical system, street lighting system, potable water system, sewage collection and treatment system, hot water and steam distribution system; as well as existing energy plants consisting of Central Boiler Plants and Local-Building Boiler Plants.
- b. We have recommended several projects that require the modification of boiler plant controls such as installation of OA HW reset control, night set-back control and installation of time-clock. These projects however, have been presented under Increments A or G.
- c. We have developed electricity and fuel consumption load profiles for the past three years and presented them in Section 3.
- d. Graphical profiles of hourly KW demand occurring on a weekday, weekend and peak demand day have been developed, presented and discussed in Paragraph 7.2.4 for each month of FY 80. We have discussed existing peak demand limiting systems, and will investigate if the EMCS is feasible for further demand limiting.

- e. Based on the AXCESS analysis of each building type, we have estimated the annual energy consumption and cost per square foot of each building type for Electricity, Fuel, Space Heating, Domestic Hot Water, Lighting and Miscellaneous Equipment. We have also projected these FY 80 to FY 84. Tabulated cost data has been presented in Section 5.

Work listed below was accomplished and submitted for Increment 9, EMCS:

- a. Supplement the site investigation with "as built" drawings, as well as sound engineering judgment.
- b. Interview administrative personnel to determine operating hours and procedures relative to the surveyed buildings.
- c. Identify EMCS energy conserving programs and strategies which might be appropriate for each of the buildings, listing the points required.
- d. Evaluate by computer analysis, energy conserved by these programs as well as their implementation costs in accordance with Energy Conservation Investment Program (ECIP) requirements.
- e. Make recommendations which may include in the EMCS some systems, points and/or programs which, while not directly related to energy savings, would provide management information and centralized control, making for more efficient facility operation.

1.4.7 FINAL SUBMITTAL

During the period January 13, 1983 through February 12, 1983, the Preliminary, Interim and Prefinal Submittals have been compiled into a Final Submittal. A description of the compilation is as follows:

- a. For Sections 1 through 7 of the Final Submittal, the Interim Narrative was used as the basic text. Relevant material from the Preliminary was included.
- b. Section 8 incorporates Section 1 through 8 and 12 through 14 of the Increment 8 Narrative.

c. Sections 9 through 11 incorporates Sections 9 through 11 of the Increment F Narrative.

d. Section 12 incorporates the Increment B, EMCS Feasibility Study of the Prefinal Submittal.

The Final Submittal Executive Summary is made up of the Interim and the Prefinal Executive Summaries. These summaries have been adapted and brought up to date where necessary. The Final Submittal Executive Summary has been compiled as follows:

a. For Sections 1 through 4, the Prefinal Executive Summary Sections 1 through 4 have been used.

b. For Sections 5 through 8, the Interim Executive Summary Sections 2 through 5 have been used.

1.5 CONCLUSIONS

1.5.1 SAVINGS RESULTING FROM IMPLEMENTED ECO'S

The effects, in energy and cost savings, of implementing all Increment A, B, C, & G projects are summarized in Table 10-1, a copy of which is included hereafter. The percent savings for these projects are obtained using the known consumption for FY 75 from Table 3.3-2. This table is presented in Section 7. The total consumption for that year is 358,834 MBtu.

Increment A projects save 18,348 MBtu/yr, or 5% of the FY 75 total consumption. Increment B projects save 29,265 MBtu/yr, or 8% of the FY 75 total consumption. Increment F projects save 54,643 MBtu/yr, or 15% of the FY 75 total consumption. Increment G projects save 19,243 MBtu/yr, or 5% of the FY 75 total consumption. The total savings for all projects is 121,500 MBtu/yr, or 34% of the total FY 75 consumption.

The effect of Increments A, B, G & F in terms of FY 84 dollars is as follows. Increment A projects will save \$215,420 per year and will cost \$597,081. Increment B projects will save \$333,202 per year and will cost \$1,904,648. Increment F projects will save \$570,794 per year and will cost \$535,556. Increment G projects will save \$223,156 per year and will cost \$549,094. The projected cost of energy in 1984 is itemized in Table 3.3-1. Escalation rates and conversion factors are given in the Attachment to Table 3.3-1. The table and attachment can be found in Section 7.

TABLE 10-1

IMPROVEMENTS A, B, F, AND G PROJECT SUMMARY
ALL-STATE SUBSTATION

PROJECT NO.	DESCRIPTION	APPLICABLE MEASURES	AGREEMENT	E/C RATIO	PAYBACK PERIOD	F104 CUE \$	ENERGY (MBTU)	ANNUAL SAVINGS (\$104)
ONE 42	Ceiling Insulation, Weather Seal Doors	None	G	67.2	1.2	49,664	3,098	48,348
ONE 43	Steam Pipe Insulation, Heating Oil/Water Control, Thermostatic Radiator Valves, Ceiling Insulation, Weather Seal Doors	None/Weather Seals	A	54.6	4.7	112,698	6,152	88,103
F 43	Insulate Heated Oil Storage Tank	Oil	F	53.8	1.9	7,250	190	3,880
ONE 44	Thermostatic Radiator Valves, Ceiling Insulation	Telephone Exchange Building	G	58.5	3.7	4,735	241	1,304
ONE 45	Day/Night Setback Control, Thermostatic Radiator Valves, Weather Seal Doors	Baracks	G	69.1	2.3	78,702	3,915	33,946
F 47	Reduce Space Temperature in Occupied Dining Room	F-27	F	68.0	2.3	10,211	491	4,450
ONE 48	Thermostatic Radiator Valves, Attic Floor Insulation, Night Setback Control	Open Area BRN/Club	G	66.9	1.7	40,253	1,446	24,200

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TABLE 10-1

INSTRUMENTS A, B, F, AND G PROJECT SUMMARY
VILLAGE DISCONTINUITY

INSTRUMENT	LOCATION	APPLICABLE BUILDINGS	INSTRUMENT	E/C RATIO	PERMITS PERIOD	ANNUAL SAVINGS	
						EST. \$ (PER YR)	PERCENT (PER YR)
INSTRUMENT A	Thermostatic Radiator Valves, Spare Thermostatic Valves, Electric Floor	Detention House/Community Center	C	38.0	2.0	29,200	1.00%
INSTRUMENT B	Thermostatic Radiator Valves	Dispensary	C	31.0	2.0	4,130	90
INSTRUMENT C	Ceiling Insulation, Weather Seal Entrance Doors and Windows	Laundry	C	32.0	2.0	6,100	2.0%
INSTRUMENT D	C.A. Hot Water Radiator with Steam Jacket, Weather Seal Entrance Doors, Ceiling Insulation	Dependent Grade School	C	32.5	2.0	11,000	1.5%
INSTRUMENT E	Acoustic Barrier Floor, Lighting with Low Energy Lamps and Ballasts	Various Buildings	F	32.1	3.0	193,000	0.1%
INSTRUMENT F	Steam Jacketed Radiator, Thermostatic Radiator Valves, Ceiling Fan Fan Motor, Radiator, Insulation Ceiling	Fire Station	F	28.6	2.0	8,500	2.0%
INSTRUMENT G	Insulation Electric Floor, Weather Seal Entrance Doors, Radiator with Night Valves, Radiator O.A., Weather Seal with Night Network	Family Housing	C	28.1	7.0	87,000	0.1%

TABLE 10-1

INCIDENTS A, B, F, AND G PROJECT SUMMARY
SILVER SPRING

PROJECT ID	DESCRIPTION	APPLICABLE BUILDINGS	INCIDENT	L/C RATIO	PERCENT PERIOD	TYPE OF CHG	ENRGT (MBTU)	ANNUAL SAVINGS (\$/YR)
F 89	Waste Heat Recovery System for Refrigeration Equipment	9-271 & 9-273	F	25.0	0.3	20,070	625	7,090
9-41	Street Lighting Vandal Control	Street Lighting	B	20.3	0.7	17,025	300	3,791
F 911	Autumn Tree Removal or Trunked Space by Building & Partition	9-122	F	17.0	0.3	0,243	76	909
9-13	DKS Feasibility Study	Various Buildings	B	16.0	5.3	1,006,723	33,019	357,219
9-13	Thermodynamic Radiator Valves, Insulate Ceiling	Applied Instruction Buildings	A	16.3	0.7	330,360	5,000	71,155
F 95	Install Vehicle Exhaust System	Motor Repair Shop	F	10.2	5.0	20,011	300	0,020
F 95	Improve Kitchen Hood Exhaust System	9-271 & 9-031	F	10.4	9.9	53,375	500	5,000
9-18-2	Insulate Ceiling	Warehouses/Warehouses	C	7.2	10.7	02,590	050	9,947
9-19-2	Ceiling Fans for Heat Recovery	Theaters	G	0.0	10.0	3,205	20	307
9-17-2	Multiple Room Control, Insulate Walls	Applied Instruction Buildings	G	5.0	15.2	60,005	325	0,235
F 917	Replace Damaged Vehicle Doors With Insulated Type	9-172, 9-300 & 9-352	F	7.0	27.5	10,050	109	1,015

TABLE NO-1

INCREMENTS A, B, F, AND G PROJECT SUMMARY
VILLAGE SANITARIETY

PROJECT NO.	DESCRIPTION	APPLICABLE BUILDINGS	INCREMENT F	L/C RATIO	PERIOD	FY94 COST	EMERIT (FY94)	ANNUAL SAVINGS FY94 (DOLLARS)
F 010	Yam Club Controls On Lumber Equipment For Night Tariff Operation	Barracks, Family Housing	F	-	11.3	10,029	0	924
	Subtotal	A - 3 Projects				997,001	10,348	215,020
		B - 7 Projects				1,903,040	29,295	133,202
		F - 30 Projects				519,556	50,643	570,790
		G - 19 Projects				599,094	19,293	223,146
	Totals	50 Projects				3,486,379	121,500	1,342,572

1.5.2 PROJECTED CONSUMPTION

Table 1.5 shows the known FY 75 total energy consumption. The projected energy consumption after energy conservation projects is identified in the table under the column heading, 1985 MBTU (PROJECTED). It assumes that all the projects in Table 10-1 are completed by 1985. This projected energy consumption is the known FY 75 consumption times (1 - % reduction). It is the amount of energy that the buildings we studied will consume in 1985 after the energy conservation projects have been implemented.

The known consumption and the projected consumption are also given on a square foot basis. The quantity under the column heading, 1975 KBTU/SF (KNOWN), uses the 1975 gross floor area, from Table 3.2-1 and the quantity under the column heading, 1985 KBTU/SF (PROJECTED) uses the 1985 gross floor area.

New construction is accounted for in Table 1.5 under the column heading, 1987 MBTU FUTURE CONSTRUCTION; an estimate for the energy that will be consumed by Vilsack in 1987 is obtained by adding the expected energy consumption of new construction (based on Design Energy Budgets which are based on AR 415-26) to the 1985 MBTU (PROJECTED). A detailed treatment of future energy use resulting from facilities changes can be found in Section 4.7.

1.5.3 GOALS

The goal of the U. S. Army is a 20% reduction of energy consumption for building area constructed before FY 76. The goals have been calculated for the Vilsack ATC and presented in Table 3.2-1. A copy of which is included hereafter.

Table 1.5 presents the projected consumption for Vilsack. It will be compared to Table 3.2-1 and it will be shown that the goals are met. From line 3 of Table 3.2-1 a FY 85 consumption of 298,592 MBtu has been set for Building Area In Use Constructed Before FY 76. This is the building area that was studied for the Energy Report. From Table 1.5, the FY 85 consumption will be 236,831 MBtu if all of the recommendations in Table 10-1 have been implemented by that time. The goal is met by a margin of 61,761 MBtu. The consumption goals on a square foot basis are met by a correspondingly large margin. The goal is 176 KBTU/sf in FY 85. From Table 1.5, the projected 1985 consumption is 140 KBTU/sf, a margin of 36 KBTU/sf.

VILSECK SUBCOMMUNITY

TABLE 1.5

PROJECTED TOTAL ENERGY CONSUMPTION MBTU/YEAR						
1975 MBTU/SP (KNOWN)	1975 MBTU (KNOWN)	REDUCTION %	1985 MBTU /SP (PROJECTED)	1985 MBTU (PROJECTED)	INCREASE FUTURE CONST.	1987 MBTU FUTURE CONST.
212	350,835	34	140	236,831	27	300,775

TABLE 1.2-1. ENERGY CONSUMPTION, FUELS AND COALS FOR FY 03. VILKOR

		1975	1980	1985
a.	Electricity			
b.	Coal	66,210	70,110	37,417
c.	Fuel Oil # 2	44,741	50,660	Coal (1985)
d.	Fuel Oil # 6	200,865	153,754	
e.	Gasoline	47,010	41,612	
f.	Total Energy	358,835	306,132	3,742
g.	Coal			1,191
h.	Coal: Total Energy Reduced 33% (10.75 m 1975)			
i.	Coal: Energy Per Sq. Ft. Reduced 20% by ACES and light, and 33 by new Efficient design (10 m 1975)			
j.	Building Area in use, constructed before FY '70			
k.	Energy Per Sq. Ft. (10 m 1975)			
l.	Coal: Energy Per Sq. Ft. Reduced 20% by ACES (1975), and light (1975), 33 by new Efficient design (10.75 m 1975)			
m.	Total Energy	358,835		223,592
n.	Building Area in use, constructed after FY '70			
o.	Coal: Energy Per Sq. Ft. Reduced 20% by ACES (1975), and light (1975), 33 by new Efficient design (10.75 m 1975)			
p.	Total Energy			73,622
q.	Building Area in use (10 m 1975)			
r.	Energy Per Sq. Ft. (10 m 1975)			
s.	Coal: 25% Reduction (10.75 m 1975)			
t.	Coal: New Facilities Energy Plan, Annex B-3			
u.	Building Energy Dept			
v.	Population			
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When accounting for future construction and demolition, the goal for FY 85 is 374,167 MBtu. The estimate of future consumption, taking into account new construction, is 300,775 MBtu in FY 87. (Refer to Table 1.5). The goal is met by 73,394 MBtu/yr. This figure is conservative because the additional construction between 1985 and 1987 increases the estimated consumption.

2. INCREMENTS A AND G

2.1 REQUIREMENTS

Increment A deals with energy conservation investigations for buildings and processes. It deals with the investigation of ECIP projects which involve modifying, improving or retrofitting existing buildings, (including family housing), to include architectural and structural features, HVAC systems, plumbing systems, interior or exterior building and parking facilities lighting.

Increment G deals with projects developed in Increment A which result in energy savings but do not qualify under ECIP criteria.

A list of Energy Conservation Opportunities (ECO's) that we investigated is presented in Table 2.1.

2.2 SUMMARY OF RESULTS

For a project to qualify as an FY 84 ECIP project, it must have an E/C > 13 , B/C > 1 , and a Project Cost $> \$100,000$. In Table 6.1, Interim Submittal we have summarized all feasible ECIP projects. A copy is included hereafter.

Energy conservation projects with E/C < 13 or Project Cost $< \$100,000$ which cannot qualify as FY 84 ECIP projects, but which we feel are suitable for implementation from non-ECIP funding sources such as OMA or MMCA Programs, have also been included in Table 6.1 as OMA projects.

As indicated in Table 6.1, we have recommended 3 ECIP Projects and 19 OMA Projects for implementation.

The original Interim Submittal version of Table 6.1 listed the projects by building type. As a result of a suggestion by the Subcommunity, to consider the combining of smaller OMA projects, the present version of Table 6.1 groups projects by type (ECIP or OMA) and within each group lists projects by E/C ratio, highest to lowest.

The combining of projects eliminates the consideration of projects by building type. What is gained is an additional ECIP project. A copy of revised Table 6.1 is used in this volume.

Table 2.1

LEGEND: PROPOSED WORK

- 1....ATTIC FLOOR INSULATION
- 2....ROOF INSULATION
- 3....WALL INSULATION
- 4....INSTALL STORM WINDOWS
- 5....WEATHER SEAL GARAGE DOORS
- 6....WEATHER SEAL ENTRANCE DOORS
- 7....INSTALL RADIATOR A/C VALVE
- 8....INSTALL O.A. RESET SYSTEM
- 9....INSTALL NIGHT SETBACK
- 10....CONVERT STEAM TO H.W. HEATING
- 11....CONVERT TO CENTRAL BOILER
- 12....INSTALL PIPE INSULATION
- 13....INSTALL NEW BOILERS
- 14....REPL. INCANDESCENT LIGHTING WITH HIGH PRESSURE SODIUM
- 15....REPL. MANIFESTED W/AUTOMATIC BOILER
- 16....REPL. H.W. STORAGE TANK
- 17....WEATHER SEAL WINDOWS
- 18....INSTALL CEILING FAN FOR HEAT RECOVERY
- 19....INSTALL SPACE THERMOSTAT
- 20....INSTALL FAN ON/OFF CONTROL
- 21....CONVERT FROM MANUAL OR NO RESET TO AUTOMATIC
- 22....INSTALL HEATING ON/OFF CONTROL
- 23....INSTALL NIGHT SETBACK WITH OR NO RESET
- 24....INSTALL MULTIPLE ZONE CONTROL

TABLE A.2

ECIP/AMA PROJECT SPENDING
WILSON SUBCOMMITTEE

BUILDING TYPE	BUILDING TITLE	PROJECT TYPE	U/C RATIO	B/C RATIO	FIRR CUE (DOLLARS)	NO. 2 OIL WELL	ANNUAL ENERGY SAVINGS		TOTAL WELL	TOTAL WELL
							WELL	WELL		
11	Motor/Vent Repair Shop	ECIP 011	50.0	8.9	112,000	6,151.7	-	-	6,151.7	61,517
-	Compass, Administration Building and Building No. 109	ECIP 021	61.9	7.6	150,019	1,021.0	2,873.0	107.0	6,730.0	60,000
11	Applied Instruction Building	ECIP 017	16.3	0.1	330,360	1,000.0	-	-	1,000.0	11,000
9	Theatre	OMA 09-1	139.0	22.0	9,100	1,228.6	-	07.1	1,237.7	10,000
2	Restrooms	OMA 02	62.0	10.2	49,665	1,697.6	-	-	1,697.6	60,000
22	Telephone Exchange Building	OMA 022	50.5	2.0	6,736	-	200.0	-	200.0	1,000
1	Barbecue	OMA 01	40.1	3.3	79,702	1,110.5	-	-	1,110.5	11,000
19	Open House, MCO/Club	OMA 019	40.1	7.5	60,073	1,003.9	-	-	1,003.9	10,000
13	Post Chapel	OMA 013	45.3	3.0	12,905	500.1	-	-	500.1	1,000
14	Shelling Alley	OMA 014	43.4	0.9	13,100	572.2	-	-	572.2	7,000
3	Gr Area	OMA 03	34.6	6.5	19,000	1,500.0	-	13.0	1,513.0	10,000

OMA 015

TABLE 6.1
ECIP/CMA PROJECT SUMMARY
VILLAGE SUB-COMMITTEE

BUILDING TYPE	BUILDING TITLE	PROJECT TYPE	E/C RATIO	M/C RATIO	ESTD COST (DOLLARS)	NO. 2 ORL MOTU	ABNORMAL EXHAUST COST MOTU	LIABILITIES MOTU	TOTAL MOTU	ESTD COST (DOLLARS)
19	Showerhouse & Water Structures	CMA 010-1	33.0	4.0	11,000	000.3	-	-	000.3	9,000
20	Water Pump & Supply Stand	CMA 011	30.9	0.5	20,000	702.0	-	-	702.0	9,000
21	Retall Stores/Commissioners	CMA 015	30.5	5.6	20,200	1,005.0	-	-	1,005.0	1,000
22	Dispensary	CMA 021	33.0	5.5	2,700	91.9	-	-	91.9	1,000
23	Laundry	CMA 010	32.0	5.3	6,720	219.1	-	-	219.1	6,000
24	Dependent Grade Schools	CMA 01	32.5	5.3	97,000	1,527.7	-	-	1,527.7	19,000
25	Flare Station	CMA 020	20.6	0.7	8,500	255.2	-	(-110.0)	145.2	3,000
26	Family Housing	CMA 05	20.3	2.0	02,000	-	1,500.0	-	1,500.0	0,000
27	House	CMA 07-2	0.0	1.7	3,200	45.0	-	(-100.0)	55.0	0,000
28	Applied Instructional Buildings	CMA 011-2	5.0	1.3	00,000	325.0	-	-	325.0	0,000
Subtotal										
					507,000	15,011.1	2,972.0	302.0	18,285.1	215,000
					509,000	10,002.6	1,372.0	05.6	19,400.2	220,000
Total					1,016,000	25,013.7	4,344.0	307.6	37,665.3	435,000

TABLE 4.2c
SUMMARY OF PROJECT 1000
VILLAGE SENSITIVITY

PROJECT TYPE	ATTIC FLOOR INSULATION	ROOF INSULATION	WALL INSULATION	INSTALL STORM WINDOWS	WEATHER SEAL EXTERIOR DOORS	WEATHER SEAL EXTERIOR WINDOWS	INSTALL RADIATOR AIR VALVE	INSTALL O.A. EXIST. VENT	INSTALL NIGHT EXTERIOR	CONVERT STAIR TO N.Y. HEATING	CONVERT TO CENTRAL BOILER	INSTALL PIPE INSULATION	INSTALL NEW BOILER(S)	TEMP. REGULATOR TO MAIN	TEMP. SENSING UNIT	TEMP. MONITORING UNIT	TEMP. N.Y. STORAGE TANK	WEATHER SEAL EXTERIOR	INSTALL CEILING FAN FOR HEAT	INSTALL SPACE THERMOSTAT	INSTALL FAN ON/OFF CONTROL	CONVERT FROM MANUAL ON/OFF	HEAT TO AIRWAYS	INSTALL HEATING ON/OFF CONTROL	INSTALL NIGHT EXTERIOR VENT	INSTALL NIGHT EXTERIOR VENT	INSTALL MULTIPLE ZONE CONTROL
1 12th St. Bldg.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
2 12th St. Bldg.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
3 12th St. Bldg.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
4 12th St. Bldg.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
5 12th St. Bldg.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
6 12th St. Bldg.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
7 12th St. Bldg.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
8 12th St. Bldg.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
9 12th St. Bldg.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
10 12th St. Bldg.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
11 12th St. Bldg.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
12 12th St. Bldg.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
13 12th St. Bldg.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
14 12th St. Bldg.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
15 12th St. Bldg.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
16 12th St. Bldg.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
17 12th St. Bldg.	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●

A new summary, Table 6.1A, Interim Submittal was created to indicate the types of ECOs included in each project. A copy of Table 6.1A is included hereafter.

If all these projects are implemented at a CWE FY 84 of \$1,146,175, the subcommunity will save 37,590.8 MBtu of energy, which is approximately 11% of its total energy consumption. The annual dollar savings will be \$458,576.

2.3 PROGRAM DOCUMENTS

A complete set of Program Documents, DD Form 1391s and PDS-1s, plus attachments, for each ECIP and OMA project are included in the Interim Submittal, Volume 5, Books 1 and 2.

1. INCREMENT B

3.1 REQUIREMENTS

Increment B requires the following:

- a. Study the existing utilities and energy distribution systems, and existing energy plants; identify and analyze possible energy conservation projects.
- b. Determine the feasibility of an EMCS for building electrical, and mechanical systems and utility distribution.
- c. Develop a load profile for the past three years indicating the quantities of each energy source procured (heating oil, coal, electricity, etc.); and the peak demand loads, and essential loads.
- d. Develop graphic presentation of hourly KW demand for peak load/demand days. Develop procedures to reduce peak demand by load shedding.
- e. Project energy costs three years from the date of Contract award, and estimate the heating, lighting and other costs per square foot per year.

3.2 SUMMARY OF RESULTS

Our investigation of potential Increment B projects resulted in two recommendations: a Street Lighting OMA project and an EMCS ECIP project. The combined energy savings amounts to 31,019 MBtu/yr with an equivalent dollar savings of \$337,239/yr. This represents a 8.5% reduction of FY 80 base-wide energy consumption.

The major savings come from the EMCS recommendation. The Street Lighting project is documented in the Preliminary Submittal, Volume 5, OMA SL1. The EMCS is described in Volume 8 of this Pre-Final Submittal. A summary of the EMCS study is presented in Section 3.1 of this narrative.

The Interim Submittal describes our investigation of Increment B projects, excluding the EMCS study, and is summarized as follows:

- a. We have obtained information on and studied in significant detail the subcommunities electrical system, street lighting system, potable water system, sewage collection and treatment system, hot water and steam distribution system; as well as existing energy plants consisting of Central Boiler Plants and Local-Building Boiler Plants.
- b. We have recommended several projects that require the modification of boiler plant controls such as installation of OA HW reset control, night set-back control and installation of time-clock. These projects however, have been presented under Increments A or G.
- c. We have developed electricity and fuel consumption load profiles for the past three years and presented them in Section 3 of the Interim Submittal.
- d. Graphical profiles of hourly kw demand occurring on a weekday, weekend and peak demand day have been developed, presented and discussed in Paragraph 7.2.4 of the Interim Submittal, for each month of FY 80. We have discussed existing peak demand limiting systems, and will investigate if the EMCS is feasible for further demand limiting.
- e. Based on the AXCESS analysis of each building type, we have estimated the annual energy consumption and cost per square foot of each building type for Electricity, Fuel, Space Heating, Domestic Hot Water, Lighting and Miscellaneous Equipment. We have also projected these FY 80 to FY 84. Tabulated cost data has been presented in Section 5 of the Interim Submittal.

3.3 INCREMENT B - EMCS FEASIBILITY STUDY

3.3.1 PURPOSE

The purpose of this study is to determine the technical and economic feasibility of utilizing Energy Monitoring and Control system (EMCS) techniques at the Vilseck Subcommunity, Vilseck, West Germany.

This effort is to develop a systematic plan to reduce energy consumption in compliance with the objectives put forth in the Army Facilities Energy Plan. Within the scope of this study, recommendations for the possible implementation of those objectives will be investigated.

3.3.2 PARAMETERS OF THE FEASIBILITY STUDY

Of the 160 buildings in the subcommunity, 104 are considered. Inclusion is based on engineering judgment for potential economic payback.

3.3.3 SCOPE OF WORK

- a. Supplement the site investigation with "as built" drawings, as well as sound engineering judgment.
- b. Interview administrative personnel to determine operating hours and procedures relative to the surveyed buildings.
- c. Identity EMCS energy conserving programs and strategies which might be appropriate for each of the buildings, listing the points required.
- d. Evaluate by computer analysis, energy conserved by these programs as well as their implementation costs in accordance with Energy Conservation Investment Program (ECIP) requirements.
- e. Make recommendations which may include in the EMCS some systems, points and/or programs which, while not directly related to energy savings, would provide management information and centralized control, making for more efficient facility operation.

3.3.4 SUMMARY

It was determined that 96 of the buildings in the Vilseck Subcommunity are technically feasible while meeting the ECIP guidelines for EMCS installation. Total cost estimate for implementation is \$1,945,596.

The estimated energy savings with the recommended EMCS are 780 MBtu of electricity (lighting) and 30,239 MBtu of heating fuel. This represents a 6% reduction of FY 80 basewide energy consumption.

ECIP Summary

CWE	\$ 1,886,723
Design Cost	\$ 58,873
Total	\$ 1,945,596

Total Benefits	\$ 4,604,185
Discounted Benefit/Cost Ratio (>1)	2.4
Total Annual Energy Savings	31,019 MBtu
E/C Ratio	16.4
Annual \$ Savings	\$ 357,239
Payback Period	5.3 yr

The proposed new EMCS equipment is to be designed to meet the requirements of the Inter-Agency Guide Specification, a document developed to standardize government procurement of strategies for centralized computer control for energy conservation. To meet this objective a small sized EMCS, according to Specification CEGS-13949, is recommended.

Buildings not recommended either did not meet initial criteria or were determined to be an ineffective application upon physical inspection.

3.3.5 EXCLUDED FROM SCOPE OF INVESTIGATION

The scope of the analysis and site investigation is limited only to those considerations which impact on energy. Excluded from consideration are all process, manufacturing or laboratory equipment and systems, as well as fire alarms and security.

3.3.6 CONCLUSIONS

In analyzing the 96 applicable buildings in the Vilseck Subcommunity, the installation reflects a total Benefit/Cost ratio of 2.4, an Energy/Cost ratio of 16.4 and payback period of 5.3 years.

Results are in accordance with ECIP B/C >1 and E/C >13 prerequisites for ECO implementation and payback period of less than 15 years.

Strategies in order of cost effectiveness:

- a. Reducing fuel consumption during the heating season by means of temperature setback during unoccupied hours.
- b. Optimized control of boilers.
- c. Lighting reduction/shutdown during unoccupied periods.

3.3.7

RECOMMENDATIONS

- a. Implement the installation of an Energy Monitoring and Control System in the Vilsack Subcommunity, Vilsack, West Germany.
- b. The system will consist of one control room to accommodate the facility.
- c. Install the EMCS at the estimated construction cost of \$1,945,596.
- d. Provide a system configuration, programs, and strategies as described in this study.
- e. Note that possible further savings can be realized by the use of EMCS to provide remote controlled space temperatures during normal occupancy periods. Additional savings may be achieved when the EMCS is used to its full potential to provide management reports and maintenance information. These have not been included in the ECIP calculations since they imply future changes in operating procedures which may not be realized.

4. INCREMENT F

4.1 OBJECTIVES

The objectives of Increment F are summarized as follows:

- a. To recommend modifications and changes in system operation which are within the Facilities Engineer funding authority and management control. Recommendations shall be in the form of specific, practical instructions for the use of Facilities Engineer personnel.
- b. To summarize and establish the priority of all energy conservation measures and projects from Increments A, B, F and G for use of the Community Commander and Facilities Engineer in developing their energy management plans.

The Scope of Work (Schedule of Title Services Rev) is included in Appendix 1-A, Volume 7 of the Prefinal Submittal.

4.2 MODIFICATIONS INVESTIGATED

A total of 32 potential modifications were investigated from which we developed twenty-seven recommendations for Building and Maintenance/Operations systems.

Sixteen of the twenty-seven recommendations relate to Building Equipment Systems and are based on an analysis of building field survey data.

Eleven recommendations relate to the Maintenance and Operation (M/O) procedures in use by the Facilities Engineer Division of the Vilseck Subcommunity. The analysis of existing M/O procedures is based on field data consisting of answers to questions put to the Facilities Engineer and members of his staff.

- 4.2.2 Two investigations were developed into recommendations concerning expendable equipment.
- 4.2.3 Two investigations developed into non-recommendations.
- 4.2.4 One investigation did not fall under the Facilities Engineer management control but because it has an easily understandable effect on energy conservation, we have included it as a miscellaneous recommendation.

4.3 SUMMARY

The projects investigated are listed, as follows:

4.3.1 MODIFICATIONS TO BUILDING SYSTEMS

<u>S&H PROJECT NO.</u>	<u>DESCRIPTION</u>
F V1	Correct the Installation of the Existing Heat Recovery Wheel.
F V2	Reduce Space Temperatures in Unoccupied Dining Rooms.
F V3	Install Automatic-Vent Damper Controls On Oil-Fired Boilers.
F V4	Boiler Water Treatment.
F V5	Improve Kitchen Hood Exhaust System.
F V6	Install Vehicle Exhaust System.
F V7	Use Cold Water Cleaning Chemical in Dishwasher Wash Cycle.
F V8	Use Cold Water Detergent For Washing Clothes.
F V9	Install Waste Heat Recovery for Refrigeration Equipment.
F V10	Insulate Heated #6 Oil Storage Tank.
F V11	Reduce the Amount of Heated Space by Building A Partition.
F V12	Replace Damaged Vehicle Doors with Insulated Types.
F V13	Retrofit Interior Fluorescent Lighting With Low Energy Lamps and Ballasts.
F V14	Install Time Clock Control on Laundry Equipment to Allow Only Night Tariff Operation.
F V15	Lower Domestic Hot Water Temperature.

F V16 Change Burner Nozzles for Off-Peak Operation.

4.3.2 MODIFICATIONS TO MAINTENANCE/OPERATIONS SYSTEMS

F V17 Preventive Maintenance Program.

F V18 Temperature Control Technician.

F V19 Reduction of Space Heating Temperatures.

F V20 Interior Lighting Control.

F V21 Window Operation.

F V22 Door Operation.

F V23 Cooking Equipment Warmup.

F V24 Upgrade Centritherm Control System.

F V25 Steam Trap Replacement.

F V26 DHW Circulating System.

F V27 Resize Primary Heating Equipment.

4.3.3 EXPENDABLE EQUIPMENT

F V28 Energy Saving Ovens.

F V29 Energy Saving Motors.

4.3.4 PROJECTS NOT RECOMMENDED

F V30 Installation of Low Energy Fluorescent Lamps and Ballasts to Replace Burned-Out Interior Lighting.

F V31 Use Warm Water Detergent in Dishwasher Wash Cycle.

The above projects are not recommended because they are alternative approaches to ECO's that are recommended. The recommended ECO's have higher E/C ratios. For a detailed analysis see the Energy Report, Final Submittal, Volume 2, Section 2.11.1. The recommended project for alternative F V30 is "Retrofit Interior Fluorescent Lighting With Low Energy Lamps and Ballasts" F V13. The recommended project for alternative F V31 is "Use Cold Water Cleaning Chemical In Dishwasher Wash Cycle", F V7.

4.3.5 MODIFICATION NOT UNDER FE MANAGEMENT CONTROL

F V32 Consolidate Partially Used Barracks.

4.4 INVESTIGATION CONCLUSIONS

The effects, in energy and cost savings, of implementing the above listed modifications are summarized in Table 2-1 of Volume 6 of the Preliminary Submittal, a copy of which is included hereafter.

4.4.1 BUILDING SYSTEMS

Building systems modifications would result in annual energy savings of 29,398 MBtu/yr. and equivalent annual dollars savings of \$294,037/yr (FY 84 escalated). This represents a 9% reduction of FY 80 basewide energy consumption. Implementation costs would amount to \$474,462. The overall payback period is 1.61 years.

4.4.2 MAINTENANCE/OPERATIONS SYSTEMS

Of the eleven M/O systems modifications five have calculable energy and cost savings, and the remaining six are recommendations without calculable savings.

The five modifications having calculable savings (F V18, F V19, F V24, F V25 and F V27), if implemented, would yield a total annual energy savings of 30,060 MBtu/yr and equivalent annual dollar savings of \$342,753/yr. This represents a 9.1% reduction in FY 80 basewide energy consumption.

The energy and cost savings for the six recommendations without calculable savings (F V17, F V20, F V21, F V22, F V23, F V26), are not easily defined. Exact factual data such as hours of occurrence (e.g. how many hours are lights left on in unoccupied spaces or rolling doors left open) could not be determined during a three week survey period. Therefore, these recommendations are general in nature and are made because of their obvious energy savings result.

Of the five modifications with calculable savings, F V19 is a no-cost implementation, F V24, F V25, F V26 have calculable implementation costs, and F V18, F V27 have no calculable implementation costs. Therefore, an overall payback period cannot be calculated for these three recommendations.

TABLE 2-1
Summary of Project Summary
Office Summary

PROJECT ID	DESCRIPTION	APPLICABLE BUILDINGS	W/C Ratio	PAIRWISE (PAIRS)	PAIRWISE (PAIRS)	PAIRWISE (PAIRS)	PAIRWISE (PAIRS)	PAIRWISE (PAIRS)
F 015	Lower Domestic Hot Water Temperature	Barracks, Mess Halls	2.5/2.4	Immediate	0-49	51	4.461	1.000
F 016	Change Room Routines for Off-Peak Operation	Various Buildings	2.175.1	Immediate	2-91	31	9.23	1.000
F 017	Hot Cold Water Intercom for Washing Closets	Barracks, Lavatories, Family Housing	1.0/1.1	Immediate	2,5-10	84	4.176	1.000
F 018	Repetitive Maintenance Program	All Buildings	-	Immediate	-	-	-	-
F 019	Temperature Controls Installation	Various Buildings	-	Immediate	-	2,000	1,000	1.000
F 020	Reduction of Space Heating Temperature	All Types Except Type 21 Dispersary	-	Immediate	-	-	14,320	1.000
F 021	Interior Lighting Controls	Various Buildings	-	Immediate	-	-	-	-
F 022	Water Operation	All Buildings	-	Immediate	-	-	-	-
F 023	Door Operation	All Buildings	-	Immediate	-	-	-	-
F 024	Cooling Equipment Warm-up	Various Buildings	-	Immediate	-	-	-	-
F 025	Domestic Hot Water Circulating System	Various Buildings	-	Immediate	-	-	-	-

Table 2-1
INCIDENTAL PROJECT SUMMARY
SILVER STAR, CALIFORNIA

PROJECT	DESCRIPTION	APPLICABLE REGULATIONS	S/C RATIO	PRIORITY CLASS	ESTIMATION COST		ESTIMATED COST	
					Est. (thous.)	PL (thous.)	Est. (thous.)	PL (thous.)
F 127	Design Primary Heating Equipment	Various Buildings	-	Immediate	-	-	2,112	61,000
F 128	Energy Saving Program	Various Buildings	-	Immediate	-	-	-	-
F 129	Energy Saving Motors	Various Buildings	-	Immediate	-	-	-	-
F 132	Consolidate Partially Used Barracks	Barracks	-	Immediate	-	-	9,325	11,122
F 137	Use Cold Water Cleaning Chemicals in Dishwasher Wash Cycle	Kitchen Halls	100.0	0.5	3,071	116	1,003	6,610
F 140	Boiler Water Treatment	Various Buildings	228.9	0.5	30,131	-	6,134	21,390
F 146	Upgrade Control Room Control Systems	Various Buildings	133.2	0.6	30,700	200	9,690	22,380
F 151	Repair Existing Heat Load Recovery System	Various Buildings	203.2	0.6	1,419	-	390	2,100
F 153	Install Automatic-Start Control System for Air-Conditioned Buildings	Various Buildings	107.7	0.6	60,000	-	1,221	60,000
F 154	Steam Pipe Replacement	Various Buildings	00.6	1.0	30,000	211	2,010	24,100

TABLE 2-1

INCIDENT & PROJECT SUMMARY
WILSON CONSTRUCTION

PROJECT ID	WILSON	APPLICABLE BUILDINGS	C/C RATIO	PAYBACK PERIOD (YEARS)	NPV (\$1000)	FE (\$1000)	INTERNAL RATE OF RETURN (%)	ASSUMED SAVINGS
F 010	Insulate Heated No. 6 Oil Storage Tank	V-226	53.8	3.9	7,295	-	390	3,000
F 012	Reduce Space Temperature in Unoccupied Dining Room	V-221	48.1	2.3	10,211	-	491	4,000
F 011	Protect Interior Flap, Lig. w/low Energy Lamp & Ballasts	Various Buildings	30.1	3.2	191,002	2,000	6,123	60,000
F 014	Install Waste Heat Recovery System for Refrig. Equipment	V-227 & V-271	25.0	0.3	20,010	-	600	1,000
F 011	Reduce the Amount of Heated Space by Building a Partition	V-122	17.9	3.3	6,201	-	70	700
F 016	Install Vehicle Exhaust System	Driver Repair Shop	10.2	5.0	20,011	-	300	4,000
F 015	Improve Kitchen Hood Exhaust System	V-227 & V-011	10.6	9.9	31,125	-	300	3,000
F 012	Replace Damaged Vehicle Doors with Insulated Doors	V-122, V-103 & V-252	2.6	27.5	10,000	-	100	1,115
F 013	Install Time Clock Controls on Laundry Equipment for Night Shift Operation	Barbecue, Family Building	-	11.3	10,000	010	0	100
Total				0.9	535,750	6,100	5,000	510,650

The recommendation for a Temperature Control Technician (F V16) was based on an analysis of a single type of inoperative control condition. Therefore, since more types of inoperative controls are normally encountered, the calculated energy savings are minimal. The uncertainty of the type and amount of inoperative controls that could develop from year to year make it impossible to calculate exact savings.

4.4.3 EXPENDABLE EQUIPMENT

The energy savings for expendable equipment (F V28, F V29) are calculated for a single piece of equipment since no one can predict how many pieces of equipment will fail at a given time. Implementation costs are also on a piece basis and are incremental costs since this is a replacement recommendation, not a retrofit.

4.4.4 MISCELLANEOUS

A practical approach to energy conservation requiring no equipment changes is suggested by the recommendation Consolidate Partially Used Barracks (F V32). This recommendation can produce considerable savings at practically no cost and for these reasons is included in our list of recommendations. Our analysis of four buildings indicates a potential annual energy savings of 1,335 Mtu/yr and an equivalent annual dollar savings of \$11,335/yr (FY 84 escalated).

4.5 ENERGY CONSERVATION MODIFICATIONS SINCE 1975

A complete listing of energy conservation related projects is given. The listing was updated in April 1982 and is current as of this date.

Many of the projects were not established as specific energy conservation projects. They were the result of normal repair projects that incorporated energy saving features. Therefore they qualified as energy conservation modifications.

The list contains two ECIP projects and fifty seven OMA projects.

4.5.1 GENERAL

A visit was made to the Engineering and Planning Division at Grafenwoehr to obtain data on energy conservation modifications at the Vilsack Subcommunity

since 1975. A review of records uncovered some additional projects. These changes have modified the list of previous energy related projects compiled for the Interim Submittal, presented in Section 2.3.1, Volume 1, of the Interim Submittal. The modified listing is presented in the following section.

4.5.2 PROJECT LISTING

ECIP PROJECTS

- 7T-0173-80* Attic insulation/installation of thermostatic radiator valves in FH Facilities, 7ATC.
- 7T-0155-84* Automatic Controls with sensors, motorized valves, wiring and small items.

OMA PROJECTS

- 7T-105-73 Repair/replace Heating System, Building No. 333.
- 7T-034-74 Repair/replace Heating System, Building No. 308.
- 7T-363-74 Repair/replace Heating System, Building No. 344.
- 7T-0161-76 Repair/replace Heating System, Building No. 343.
- 7T-0162-76 Repair/replace Heating System, Building No. 338.
- 7T-0191-76 Repair/replace Heating System, Building No. 201.
- 7T-0199-76 Upgrade Central Heating and Electrical Systems, Building No. 432.
- 7T-0265-76 Repair/replace Heating System, Electrical System and Long Distance Lines, Buildings No. 131, 132, 133.
- 7T-0307-76 Replacement of Radiator Valves, Buildings No. 475 through 478.
- 7T-0308-76 Repair/replace Heating System, Building No. 332.

77T-0319-76 Replace Windows, Doors and Entrance
Doors, Building No. 416.

77T-0041-77 Repair/replace Heating System, Buildings
No. 306, and 316.

77T-0042-77 Repair/replace Heating System, Buildings
No. 307 and 317.

77T-0043-77 Repair/replace Heating System, Buildings
No. 303 and 313.

77T-0044-77 Repair/replace Heating System, Buildings
No. 304 and 314.

77T-0136-77 Replace Windows, Buildings No. 414, 424,
425, 433 and 434.

77T-3406-77 Building No. 112. Add ceiling
insulation. No documents available.

77T-0088-78 Repair/replace Heating System, Building
No. 431.

77T-0173-78 Repair/replace Heating System, Buildings
No. 273, 274, and 275.

77T-0270-78 Rehab. heating Building No. 256.
Received specifications.

77T-0098-79 Roof repair of Buildings No. 252 through
256.

77T-0099-79 Received work request and specification.

77T-0130-79 Repair doors and insulate ceiling in
Building No. 308. Received work request
and specification.

77T-0138-79 Rehab. heating Building No. 224. Design
in preparation. No documents available.

77T-0439-79 Rehab. of Building No. 427. Received
work request and specification.

77T-0010-80 Rehab. heating Building No. 339. Design
in preparation. No documents available.

77T-0036-80 Repair leaky windows in Fitzthum Village.
Received work request.

7T-0103-80 Central heating of Buildings No. 103, 104, 114 through 117 and 134. Received work request. Design in preparation. No documents available.

7T-0122-80 Rehab. heating system in Building No. 322 (Laundry). Received work request and specification.

7T-0150-80 Rehab. four mess halls in "1,000 man camp". Seen specifications.

7T-0279-80 Replace air conditioning system Building No. 113. Received work request.

7T-0318-80 Replace front doors in Building No. 354 (Theatre). Received work request.

7T-0361-80 Rehab. heating Building No. 324. Seen specification.

7T-0357-80 New lights in Building No. 323 (Gymnasium). Received work request and specification.

7T-0411-80 Rehab. of Heating system in Buildings No. 345 and 346; and connect to heating plant in Building No. 355. Received work request and specification.

7T-0414-80

7T-0413-80 Rehab. heating Building No. 260 area. No documents available.

WO-3151-80 Building No. 336 Rehab. Building and heating system, connect to Building No. 355. No documents available.

WO-3156-80 Building No. 224. Replace windows. No documents available.

WO-3179-80 Building No. 264. Install ceiling and wall insulation. No documents available.

WO-3212-80 Building No. 202. Install ceiling insulation, replace windows. No documents available.

WO-3294-80 Building No. 341, 342. Replace roof, add external wall insulating cement. No documents available.

7T-0077-81 Building No. 225 New Windows, New Heating System, Connect to Boiler in Building No. 248. Received work request.

7T-0119-81 Replace single pane windows with double
7T-0120-81 pane thermal glass in the 16 billets and
7T-0121-81 4 mess halls of "1,000 man camp", and
7T-0124-81 replace old exterior plaster by
7T-0129-81 insulating plaster in the 16 billets.
Received copy of work request.

7T-0306-81 Buildings No. 233 and 234. Replace roof,
add external wall insulating plaster. No
documents available.

7T-0315-81 Buildings No. 231 and 232. Replace roof,
add external wall insulating plaster. No
documents available.

7T-0316-81 Rehab. heating, Buildings No. 243 and
244. No documents available.

7T-0320-81 Rehab. of Building No. 221. No documents
available.

7T-0327-81 Buildings No. 273, 274 and 275. Replace
windows. No documents available.

7T-0429-81 Building No. 301: Rehab. heating system,
new windows, wall and ceiling insulation,
connect to Building No. 355. Building
No. 354: Convert steam heating system to
hot water, add blowers. No documents
available.

WO-3274-81 Building No. 431: Rehab building. No
documents available.

WO-3294-81 Building No. 121: Rehab building. No
documents available.

* Project is unfunded or subject to available funds.

4.6

INCREMENT PROJECTS BY E/C RATIO

Table 10-1, Volume 6 of the Preliminary Submittal, ranks all the recommended Increment A, B, F and G projects by E/C ratio. A copy is included in this Summary.

4.7 FUTURE ENERGY CONSUMPTION

4.7.1 GENERAL

In this Section we have analyzed the effect of future facility changes on the energy consumption of the Vilseck Subcommunity. Tables 11-1, 11-2 and 11-3 list the changes in construction in two categories: New Constructions and Demolitions. These tables are included in Appendix 11-B, Volume 7, Prelinal Submittal.

4.7.2 AVAILABLE DATA

Vilseck did not have a formalized Master Plan so we developed our estimated future energy use from other data made available to us. The data consisted of:

- a. 7ATC MCA Project Status Report, dated 10 February, 1982.
- b. Building floor areas from 7ATC Master Planning Section, Grafenwoehr.
- c. Design Energy Budgets listed in ETL 1110-3-295.

Since the average heating degree days (HDD) at Vilseck is more than 7,000 per year, Climatic Region No. 1 was selected and used to determine the Design Energy budgets appropriate to the proposed facility changes.

4.7.3 ANALYSIS

The estimated energy usage of 1,403,666 SF of new construction is 91,359 MBtu/yr. This is equivalent to 28% of the total energy consumption of FY 80.

The estimated energy reduction from 13,904 SF of demolitions is 998 MBtu/yr. This is equivalent to 0.3% of the total energy consumption of FY 80.

Therefore, the net estimated future energy consumption for the Vilseck Subcommunity is 90,361 MBtu/yr and results from all facilities changes planned up to and including FY 86. This is equivalent to a 27% increase in total energy consumption of FY 80.

It is assumed that all new construction will incorporate required energy conservative features in their designs.

4.8

TRAINING COURSES

We have presented in Section 12, Volume 6 of the Preliminary Submittal recommendations on Government and Commercial sponsored training courses. We recommend these courses as additional training for the Vilseck Facilities Engineer Division.

It is not our intent to suggest that this additional training be considered as basic training but rather as refresher or familiarization courses. Training is required to update current knowledge and to learn new technology.

The one course we strongly recommend is the Preventive Maintenance Seminar.

5. ENERGY CONSUMPTION ANALYSIS USING ACCESS COMPUTER PROGRAM (INCREASING A & G ONLY)

5.1 MODELING OF SURVEYED BUILDINGS

Each of the surveyed buildings has been modeled on the ACCESS Input Data Sheets, using field survey data, weather data supplied by EUD, occupancy schedules, building construction data, etc; and the model verified against historical energy use (when available) and adjusted until reasonable agreement is obtained.

5.2 COMPUTER OUTPUT

Each Output consists of three parts:

- a. Input data
- b. Design day space heat gain calculation, (based on 18°C outside air temperature).
- c. Result of the hour-by-hour ACCESS energy consumption calculations. The Result consists of a two page output.

The first page shows the month-by-month consumption values of:

- | | |
|--------------------------------|------------------------|
| 1. Total Source Energy | : MBtu |
| 2. Electricity | : kwh |
| 3. Anthracite Coal | : m-tons |
| 4. Fuel Oil No. 2 | : gal |
| 5. Fuel Oil No. 6 | : gal |
| 6. Interior Lights | : kwh |
| 7. Equipment | : kwh |
| 8. Misc. Equipment | : kwh |
| 9. Fan Power | : kwh |
| 10. Domestic Hot Water energy) | : MBtu (source energy) |

The second page shows the month-by-month consumption values of all the above 10 quantities in kBtu/yr/sf of building area.

It also indicates the annual percent of total energy consumption by each of the above 10 quantities.

5.3 UTILIZATION OF AXCESS RESULTS

As a result of making an AXCESS analysis of buildings of every type, the average kBtu/yr/sf of each building type has been determined.

Knowing the square foot area of all buildings of each type, energy consumed by all buildings of a given type has been calculated by extrapolation.

By analyzing all types of buildings, the energy consumed by all the buildings in the Subcommunity has been estimated.

5.4 AVERAGE ENERGY CONSUMPTION PER BUILDING TYPE

Based on the analysis of the surveyed buildings, the weighted average values of annual source energy consumption per square foot by each of the building types for space heating, domestic hot water, lighting and miscellaneous electric power, are shown in Table 5-1. In Table 5-2, the above values have been expressed as percentages of the total source energy per building type.

5.4.1 GENERAL COMMENTS

We observe that the average total source energy consumption is 190 kBtu/yr/sf of which 34 units (18%) are electrical and 156 units (82%) are fuel.

On an average, a building consumes 13% units for space heating, 20 for DMW, 16 for lighting and 19 for miscellaneous electrical equipment.

Three building types consume more than 200 kBtu/yr/sf for space heating; and as a result of the recommended energy conservation projects, these values will be significantly lowered.

ENERGY ENGINEERING ANALYSIS PROGRAM, EETPE

29-SEP-72

PROGRAM LIST7

ENERGY CONSUMPTION : SUMMARY RESULTS OF AEECS PROGRAM

Table 5-1

VILSIX SUBCOMPLXITY

- AVERAGE ENERGY CONSUMPTION BY BLDG TYPE -
- BTU PER SQUARE FOOT PER YEAR -

BLDG	TYP	GRF	TOTAL	FUEL	ELEC	SPACE	RAI	LIGHT	MISC1	MISC	BOILER	ACTUAL
-1-	-2-	-3-	ENERGY	-5-	-6-	HEAT	-8-	-9-	-10-	LT/EGP	MW	FUEL
			-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-	-12-	-13-
ENUSO	1	377272.	139.3	114.3	25.0	84.7	29.7	19.3	9.4	1.1	0.3	191.6
NUTMENTS	2	53296.	116.2	113.5	2.7	113.5	9.0	2.7	0.0	0.0	0.0	100.4
EN MESS	3	44879.	294.2	260.1	34.1	170.0	90.1	12.7	21.4	0.0	21.4	275.2
FAN HNG	5	235148.	243.9	199.9	53.0	154.4	36.6	22.9	20.1	26.6	3.5	190.4
FR HNG H	6	37920.	146.9	97.6	49.3	73.5	24.1	19.3	30.0	11.7	18.3	107.0
SCHOOL	7	32461.	195.3	167.0	28.3	163.7	3.3	21.9	6.4	0.0	6.4	173.3
THEATER	9	10403.	293.9	252.3	41.6	231.5	0.8	7.9	33.7	19.7	14.0	252.2
LAUNDRY	10	11184.	260.3	203.1	57.4	175.6	27.5	4.2	32.2	42.4	10.8	212.8
NOTR APR	11	105936.	294.4	262.7	31.7	254.9	3.8	15.7	16.0	4.4	11.6	247.8
STRAHLEN	12	37339.	222.5	202.2	20.3	277.4	24.0	13.6	6.7	0.0	6.7	333.3
CHAPPEL	13	4431.	177.7	152.2	25.5	151.5	0.7	10.4	13.1	3.0	13.1	151.3
ROWLING	14	11741.	222.3	181.3	42.0	180.7	0.6	7.9	34.1	27.7	4.4	171.1
CENSARY	15	40858.	296.0	180.2	105.8	177.9	2.3	24.3	71.5	36.7	14.8	190.8
ACFTSTPA	16	84127.	153.8	127.5	26.2	114.6	12.9	12.3	12.9	0.0	12.9	66.6
APPL INS	17	233432.	179.2	160.2	19.0	159.3	6.9	10.3	9.7	0.7	8.0	167.2
WAREHSE	18	84531.	166.0	143.8	22.2	144.5	1.5	4.2	15.9	1.0	15.0	149.3
OFF MESS	19	33727.	270.9	175.7	95.2	153.1	22.6	22.7	62.5	52.6	8.9	209.4
WIRE MESS	20	6778.	218.6	161.7	56.9	157.5	4.2	17.4	29.5	0.0	29.5	152.2
DISPENS	21	7456.	114.3	80.3	34.0	75.1	2.2	17.2	16.8	0.0	16.8	106.2
TELECOM	22	6222.	275.0	170.0	105.0	170.0	0.0	22.0	83.0	61.0	22.0	138.9
FR MESS H	24	124738.	148.4	94.5	53.9	60.2	36.7	17.4	34.1	27.2	4.9	91.1
MENTIONED			190.4	152.5	35.0	134.4	21.1	15.7	19.3	10.4	6.9	162.5
AVERAGE												0.2

* NOTE: Space heating includes dryer energy consumption.

8-32-77

GOVT CONSUMPTION : SUMMARIZED RESULTS OF ACCESS PROGRAM

Table S-2

WILSON SUBCOMMITTEE

DESCRIPT	TYP	SF	TOTAL ENERGY	FUEL	ELEC	SPACE HEAT	DHW	LIGHT	MISC.	MISC. LIT/ESP	BOILER AUX	ACTIONAL FUELS
-1-	-2-	-3-	-4-	-5-	-6-	-7-	-8-	-9-	-10-	-11-	-12-	-13-
DRYING	1		100.0	82.1	17.9	60.8	21.3	11.1	6.8	0.8	6.0	108.9
NUTRENTS	2		100.0	97.7	2.3	97.7	8.0	2.3	0.0	0.0	0.0	96.4
BR MESS	3		100.0	98.4	11.6	57.8	30.6	4.3	7.3	0.0	7.3	93.5
PAN MENO	3		100.0	78.3	21.7	63.3	13.0	9.4	12.3	10.9	1.4	78.1
PH KENT N	4		100.0	64.4	35.6	50.0	16.4	13.1	20.6	8.0	12.5	72.8
SCHOOL	7		100.0	93.5	14.5	83.8	1.7	11.2	2.3	0.0	3.3	140.2
THEATER	9		100.0	85.8	14.2	65.4	0.3	2.7	11.5	6.7	4.8	65.8
LAUNDRY	10		100.0	78.0	22.0	67.4	18.6	1.6	20.4	16.3	4.1	82.1
HOTR PPR	11		100.0	89.2	10.8	87.3	2.0	3.3	3.4	1.5	3.9	84.2
GYMNASIUM	12		100.0	93.7	6.3	86.0	7.7	4.2	2.1	0.0	2.1	109.3
CHAPEL	13		100.0	85.6	14.4	85.3	0.4	3.9	8.5	0.0	8.5	85.1
BOWLING	14		100.0	81.2	18.8	80.9	0.3	2.5	15.3	12.4	2.9	76.4
CERTIFICARY	15		100.0	63.0	37.0	62.2	8.8	12.0	25.0	19.8	5.2	66.7
ADMINISTR	16		100.0	80.3	19.7	72.2	8.1	11.6	8.1	0.0	8.1	61.8
APPL INS	17		100.0	89.4	10.6	88.9	0.5	3.7	4.9	0.4	4.5	93.3
WAREHOUSE	18		100.0	87.9	12.1	87.0	0.9	2.5	7.6	0.6	9.0	90.1
OFF PRS	19		100.0	64.9	35.1	56.5	8.3	12.1	23.1	19.8	3.3	77.3
PERS HSE	20		100.0	74.0	26.0	72.0	1.9	9.0	18.1	0.0	18.1	70.1
DISPENSARY	21		100.0	70.3	29.7	68.3	1.9	15.0	14.7	0.0	14.7	144.7
TELESCOPIC	22		100.0	61.8	38.2	61.8	0.0	8.0	39.2	22.2	8.0	50.5
PH MED N	24		100.0	65.3	34.7	48.6	24.7	11.7	23.0	18.3	4.6	61.4
AVERAGE PERCENT			100.0	81.6	18.4	70.5	11.1	8.2	10.1	5.5	4.7	85.9

ENERGY ENGINEERING ANALYSIS PROGRAM GUIDE

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PROGRAM LIST

HEADING DEFINITIONS

Tables 5-1 and 5-2

COLUMN	EXPLANATION
-1-	DESCR : DESCRIPTION OF BUILDING TYPE
-2-	TYP : DESIGNATED TYPE NUMBER FROM INCIDENT 'A'
-3-	GSE : TOTAL GROSS SQUARE FOOTAGE FOR BUILDINGS OF THE PARTICULAR TYPE
-4-	TOTAL : TOTAL ENERGY CONSUMPTION PER TYPE (KBTU/SF) PER YEAR COLUMN (5) + COLUMN (6)
-5-	FUEL : TOTAL FUEL CONSUMPTION PER TYPE (KBTU/SF) PER YEAR COLUMN (7) + COLUMN (8)
-6-	ELEC : TOTAL ELECTRICITY CONSUMPTION PER TYPE (KBTU/SF) PER YEAR COLUMN (9) + COLUMN (10)
-10-	MISC : MISCELLANEOUS CONSUMPTION OF ELECTRICITY COLUMN (11) + COLUMN (12)
-11-	LT/ESP : INCLUDES EXTERIOR LIGHTING AND EQUIPMENT SUCH AS LAUNDRY MACHINES, COFFINING EQUIPMENT, AND MISCELLANEOUS HOUSEHOLD EQUIPMENT.
-12-	BOILER HT : INCLUDES BOILER PUMPS, POWER MOTORS, UNIT HEATER PANS AND FURNACE PANS.
-13-	ACTUAL FUE : ACTUAL KNOWN FUEL CONSUMPTION. DOES NOT INCLUDE ELECTRICITY.

REMARKS: ALL DATA ARE FOR THE YEAR 1980. IF THE YEAR IS DIFFERENT, THE DATA SHOULD BE ADJUSTED TO THE YEAR 1980. THE DATA SHOULD BE ADJUSTED TO THE YEAR 1980.

5.5 TOTAL ENERGY CONSUMPTION PER BUILDING TYPE AND BY ENTIRE SUBCOMMUNITY

The annual values of total fuel (coal or oil) consumption (MBtuF), electricity consumption (MWH and equivalent source (MBtuE)) as well as total energy (fuel and electricity consumption (MBtuT)) by each type of building have been determined, as shown in Table 5-3, using the average values per building type and the GSF area of the type.

The "miscellaneous" consumption consists of the consumption by items such as Street Lighting, Sewage Treatment Plant and Water Pump Station.

Table 5-3 also shows the percent of total fuel, total electricity and total energy, consumed by each of the building types.

5.5.1 GENERAL COMMENTS

5.5.1.1 FUEL CONSUMPTION

We observe that the topmost consumers of fuel (coal and oil) are the following building types:

Family Housing	= 24.2%
EM Barracks w/o Mess	= 17.8%
Applied Instruction	= 14.0%
Motor/Tank Repair	= 13.2%

These building types consume 70% of the total fuel.

5.5.1.2 ELECTRICITY CONSUMPTION

The leading consumers of electricity are the following building types:

Family Housing	= 35.5%
EM Barracks w/o Mess	= 16.1%
Applied Instruction	= 6.9%
Commissary	= 6.7%
Motor/Tank Repair	= 6.6%

ENERGY ENGINEERING ANALYSIS PROGRAM, EUROPE
PROGRAM 118753
VILSECK SUBCOMMUNITY

BASELINE EXTRAPOLATED ENERGY CONSUMPTION
20-SEP-72
Table 5-3

TYP NO. -1- -2-	GPF -3-	AVG PER SF/YR			TOTAL PER YR			PERCENTAGE					DESCRIP -14-
		127F -4-	127E -5-	127T -6-	127F -7-	127E -8-	127T -9-	FUEL -10-	ELEC -11-	TOTAL -12-	GPF -13-		
1 24.	399272.	114.3	25.0	139.3	43645.	9762.	53407.	17.6	13.7	17.2	23.7	ENV/ROO	
2 16.	53296.	113.3	2.7	116.2	4276.	149.	4425.	2.4	0.2	2.0	3.2	WATMENTS	
3 6.	46879.	340.1	34.1	204.2	12198.	1599.	13798.	4.7	2.5	4.2	2.8	DR PRESS	
5 18.	235148.	190.9	53.0	243.9	44899.	12440.	57340.	17.2	19.7	17.8	14.0	FAM HSD	
6 3.	37920.	97.6	49.3	146.9	3701.	1849.	5570.	1.4	3.0	1.7	2.3	PH HSD 4	
7 2.	32441.	167.0	28.3	195.3	5421.	919.	6340.	2.1	1.3	2.0	1.9	SCHOOL	
9 1.	10485.	252.3	41.6	293.9	2645.	436.	3082.	1.0	0.7	1.0	0.6	THEATER	
10 1.	11184.	203.1	57.4	260.5	2272.	642.	2914.	0.9	1.0	0.9	0.7	LAUNDRY	
11 11.	105934.	262.7	31.7	294.4	27327.	3234.	31162.	10.7	5.3	9.7	6.3	NOTR RPR	
12 2.	27539.	202.2	20.3	222.5	11314.	762.	12104.	4.4	1.2	3.8	2.2	GYMNASIUM	
13 1.	6651.	152.2	25.5	177.7	1099.	169.	1178.	0.4	0.3	0.4	0.4	CHAPEL	
14 1.	11741.	181.3	42.0	223.3	2129.	493.	2622.	0.8	0.8	0.8	0.7	BOWLING	
15 4.	40558.	180.2	105.8	286.0	7362.	4222.	11584.	2.8	6.8	3.6	2.4	CEMISARY	
16 19.	24187.	127.5	31.2	158.8	10757.	2629.	13386.	4.1	4.2	4.1	5.0	ADMINSTR	
17 23.	23452.	160.2	19.0	179.2	37433.	4446.	41980.	14.4	7.0	13.0	10.9	SPL LVS	
18 8.	24531.	145.8	20.1	166.0	12618.	1744.	14362.	4.9	2.8	4.5	3.1	GRNCE	
19 3.	28727.	175.7	95.2	270.9	6805.	3493.	10498.	2.6	5.8	3.3	2.3	OFF BREST	
20 1.	6278.	161.7	94.9	256.6	1031.	362.	1394.	0.4	0.6	0.4	0.4	FIRE HSE	
21 1.	7456.	80.3	24.0	114.3	899.	254.	1152.	0.3	0.4	0.3	0.4	DISPACED	
22 1.	4222.	170.0	105.8	275.0	1056.	653.	1711.	0.4	1.0	0.5	0.4	TELECOM	
24 8.	164091.	95.9	51.5	147.4	16076.	8556.	24633.	6.2	13.5	7.6	9.9	PH HSD 4	
25 0.	0.	0.0	0.0	0.0	0.	3851.	3851.	0.0	1.1	1.2	0.0	MISCELL	
153.	1617401.	153.2	37.5	191.5	259105.	67318.	326422.	100.0	100.0	100.0	100.0	EXTRAP 14 E	
		147.8	42.8	190.7	254034.	74118.	328152.	100.0	100.0	100.0	100.0	EXTRAP 14 S	
TYP NO. -1- -2-	GPF -3-	127F -4-	127E -5-	127T -6-	127F -7-	127E -8-	127T -9-	FUEL -10-	ELEC -11-	TOTAL -12-	GPF -13-	DESCRIP -14-	

ENERGY ENGINEERING ANALYSIS PROGRAM: EUROPE
PROGRAM LISTED
VILSECK SUBCOMMUNITY

1. PERCENTAGE ESTIMATED ENERGY CONSUMPTION
20-SEP-62
Table 5-3

MEASURING DEFINITIONS

1. TYP : BUILDING TYPE AS DEFINED BY INCIDENT "A"
2. NO. : TOTAL NUMBER OF BUILDINGS PER TYPE
3. GSF : TOTAL GROSS SQUARE FOOTAGE PER TYPE
4. FBTUE : AVERAGE YEARLY CONSUMPTION OF FUEL (COAL/OIL) ON A PER SQUARE FOOT BASIS IN BTU (BTU/1000)
5. EBTUE : AVERAGE YEARLY CONSUMPTION OF ELECTRICITY ON A PER SQUARE FOOT BASIS IN BTU (BTU/1000)
6. FBTUT : AVERAGE YEARLY ENERGY CONSUMPTION ON A PER SQUARE FOOT BASIS IN BTU (BTU/1000)
COLUMN (4) + COLUMN (5)
7. FBTUF : TOTAL YEARLY FUEL (COAL/OIL) CONSUMPTION
IN BTU (BTU/1000000)
COLUMN (2) x COLUMN (4)
8. EBTUE : TOTAL YEARLY ELECTRICITY CONSUMPTION
IN BTU (BTU/1000000)
COLUMN (2) x COLUMN (5)
9. FBTUT : TOTAL YEARLY ENERGY CONSUMPTION
IN BTU (BTU/1000000)
COLUMN (2) x COLUMN (6)
- PERCENTAGE :
10. FUEL : PERCENT OF FUEL CONSUMED IN RELATION TO TOTAL
BASE CONSUMPTION
COL. (7) x 100/COMMUNITY FUEL CONSUMPTION
11. ELEC : PERCENT OF ELECTRICITY CONSUMED IN RELATION TO TOTAL
BASE CONSUMPTION
COL. (8) x 100/COMMUNITY ELEC. CONSUMPTION
12. TOTAL : PERCENT OF TOTAL ENERGY CONSUMED IN RELATION
TO TOTAL BASE CONSUMPTION
COL. (9) x 100/TOTAL COMMUNITY ENERGY CONSUMPTION
13. GSF : PERCENT OF GROSS SQUARE FOOTAGE IN RELATION TO
TOTAL BASE SQUARE FOOTAGE
COL. (3) x 100/COMMUNITY GSF
14. DESCRIP : DESCRIPTION OF BUILDING USE PER TYPE

Officers Mess/Club • 5.7%

Administration • 4.1%

These building types consume 82% of the total electricity consumption.

5.6 PRESENT AND PROJECTED ENERGY COSTS

Based on the average energy consumption values obtained we have developed and shown the present FY 80 as well as projected FY 84 energy costs (if no energy conservation actions are implemented) for space heating, DHW, lighting, miscellaneous, and total energy for each building type in Tables 5-4A and 5-4B.

5.6.1 GENERAL COMMENTS

We observe that on an average, the annual energy cost is 93 cents per square foot, of which 65 cents is for space heating, 10 cents is for DHW, 8 cents for lighting and 10 cents for miscellaneous electrical equipment such as boiler pumps, unit heater fans, washing machines and stoves.

Between FY 1980 and FY 1984, the energy cost will increase by a factor of 1.6 if no energy conservation measures are implemented; i.e., the annual energy cost will increase from approximately \$1.2 million to \$1.9 million.

ENERGY ENGINEERING ANALYSIS PROGRAM: ELPOPE
PROGRAM LIST#
VILSECK SUBCOMUNITY

10-SEP-82

Table 5-4A

ENERGY COST-1980: CENTS/RS FT

FUEL COST : \$ 4.81/RS TU ELECTRIC COST : \$ 9.14/RS TU

BLDG TYPE	BLDG DESC	RSF	FUEL		ELECTRICITY		TOTAL
			SPACE HEAT	RM	LIGHTS	MISC	
COSTS/RS FT, 1980							
1	EA/BOG	399272.	41.	14.	8.	5.	68.
2	W/THENTS	55296.	55.	6.	1.	0.	56.
3	EN MESS	44899.	62.	43.	7.	11.	163.
5	FAH MSNG	225148.	74.	18.	12.	16.	119.
6	FR HOD N	77920.	75.	12.	10.	15.	72.
7	SCHOOL	57441.	79.	2.	11.	3.	95.
9	THEATER	16485.	121.	0.	4.	17.	143.
10	LAUNERY	11186.	84.	13.	2.	27.	127.
11	NOTR RPR	105936.	124.	3.	8.	8.	143.
12	GYMNASIUM	37539.	133.	12.	7.	3.	156.
13	CHAPEL	6631.	73.	0.	5.	8.	86.
14	BOILING	11741.	87.	0.	4.	18.	109.
15	COURTNEY	40853.	84.	1.	18.	37.	141.
16	ASTROSTR	84187.	87.	6.	9.	7.	77.
17	APP. INS	273452.	77.	9.	5.	5.	87.
18	HOUSE	84531.	49.	1.	2.	8.	61.
19	OFF MESS	39727.	74.	11.	17.	32.	134.
20	PIPE MEE	6378.	76.	2.	9.	20.	107.
21	DISPCHRY	7454.	39.	.	9.	9.	56.
22	TELECOM	6222.	82.	.	11.	43.	136.
24	FR HOD N	124922.	79.	18.	9.	18.	73.
AVERAGE			65.	10.	9.	10.	93.

ENERGY ENGINEERING ANALYSIS PROGRAM, EUROPE
PROGRAM LIST 6
VILSECK SUBCOMMUNITY

30-SEP-72

Table 3-4B

ENERGY COST-1974: CENTS/SQ FT

		FUEL COST	1 6	7.84/MBTU	ELECTRIC COST		1 6	8.41/MBTU
BLDG TYPE	BLDG DESC	SQ FEET	FUEL		ELECTRICITY			TOTAL
			SPACE HEAT	GAS	LIGHTS	MISC		
CENTS/SQ FT, 1974								
1	CHURCH	399272.	66.	23.	13.	8.	111.	
2	WITNESS	55276.	89.	0.	2.	0.	91.	
3	CHURCH	44879.	133.	71.	11.	18.	233.	
5	PAV HSG	233149.	121.	29.	19.	25.	194.	
6	PAV HSG N	30920.	98.	19.	16.	23.	118.	
7	SCHOOL	32441.	128.	3.	18.	5.	153.	
9	THEATER	10485.	197.	1.	7.	28.	233.	
10	LAUNDRY	11186.	138.	22.	4.	45.	209.	
11	HOUS. RPR	108936.	201.	5.	13.	13.	233.	
12	GYMNASIUM	37539.	217.	19.	11.	6.	254.	
13	CHURCH	6631.	119.	1.	9.	13.	141.	
14	ROLLING	11741.	142.	0.	7.	67.	177.	
15	CONISARY	49859.	137.	2.	29.	60.	230.	
16	ADMINSTR	84 27.	90.	10.	15.	11.	126.	
17	APPL. INS	233452.	125.	1.	9.	7.	142.	
18	HOUSE	84131.	113.	1.	4.	13.	131.	
19	OFF. HSG	26757.	125.	18.	27.	55.	216.	
20	FIRE HSE	6378.	123.	2.	15.	73.	173.	
21	DISPENSY	7454.	61.	2.	14.	14.	92.	
22	TELECOM	4222.	122.	0.	19.	70.	222.	
24	PAV HSG N	126758.	47.	29.	15.	28.	119.	
AVERAGE			105.	17.	13.	16.	151.	

6.

INFORMATION RECEIVED FROM SUBCOMMUNITY

We have presented in Section 2 of the Energy Report details of the following:

- a. Drawings
- b. Utility and Fuel Bills
- c. Information of Previous Studies
- d. Building Information Schedule
- e. Basic Utility System Maps
- f. Facility Engineering Technical Data Report
- g. Subcommunity Fixed Facility Energy Plan
- h. Land Use Plan and Planned Physical Plant Expansion Data
- i. Population Data

7.

ENERGY CONSUMPTION DATA AND SUBCOMMUNITY GOALS

Presented herein are the following tables:

Table 3.3-1 Fuel and Electricity Prices

Table 3.3-2 Annual Energy Consumption and Cost Profile
for FY 75, 78, 79 and 80

Table 3.2-1 Energy Consumption Goals for FY 85

Table 3.4 Vilseck Typical building Energy
Consumption

VILSECK

Table 3.2-1

FY 84 FUEL PRICES, BASED ON FUEL PRICES IN FY 81

FUEL	UNIT	FY 81		FY 84	
		\$ UNIT	\$ MBTU	\$ UNIT	\$ MBTU
ELECTRICITY	KWH	0.08	6.896	0.12	9.950
COAL	M-TON	127	4.071	169	5.419
NO. 2 OIL	GAL	1.22	8.796	1.81	13.032
NO. 6 OIL	GAL	0.87	5.860	1.29	8.682
ELECTRIC DEMAND	KVA	9.50	--	13.707	--

CONVERSION FACTORS: $(10)^6 \frac{\text{BTU}}{\text{MBTU}}$

$0.0116 \frac{\text{MBTU ELECTRICITY}}{\text{KWH}}$

$31.2 \frac{\text{MBTU COAL}}{\text{M-TON}}$

$0.1387 \frac{\text{MBTU NO. 2 OIL}}{\text{GAL}}$

$0.1485 \frac{\text{MBTU NO. 6 OIL}}{\text{GAL}}$

ATTACHMENT TO TABLE 3.3-1

BACKUP - USEFUL DATA

ANNUAL ESCALATION RATES PER "ECIP"				
FUEL	FY 81	FY 82	FY 83	FY 84
ELECTRICITY	130	130	130	130
COAL	100	100	100	100
OIL	140	140	140	140

CONVERSION FACTORS	
1 US DOLLAR	= 2 DM
28.3 Mbtu/short ton of Anthracite Coal	
1 short ton	= 907.1847 kg
1 M-ton	= 1000.0000 kg
1 gallon	= 3.785 liters
1 US DOLLAR per gallon	= 0.5284 DM per liter

ANNUAL ENERGY CONSUMPTION AND COST PROFILE--VLS&K

CITY	WATER SUPPLY IN ACRES	CUBIC FEET PER DAY	CONSUMPTION IN 1973				CONSUMPTION IN 1974				TOTAL 1973-74	TOTAL 1975-76	TOTAL 1977-78	TOTAL 1979-80	TOTAL 1981-82	TOTAL 1983-84	TOTAL 1985-86	TOTAL 1987-88	TOTAL 1989-90	TOTAL 1991-92	TOTAL 1993-94	TOTAL 1995-96	TOTAL 1997-98	TOTAL 1999-00	TOTAL 2001-02	TOTAL 2003-04	TOTAL 2005-06	TOTAL 2007-08	TOTAL 2009-10	TOTAL 2011-12	TOTAL 2013-14	TOTAL 2015-16	TOTAL 2017-18	TOTAL 2019-20	TOTAL 2021-22	TOTAL 2023-24	TOTAL 2025-26	TOTAL 2027-28	TOTAL 2029-30	TOTAL 2031-32	TOTAL 2033-34	TOTAL 2035-36	TOTAL 2037-38	TOTAL 2039-40	TOTAL 2041-42	TOTAL 2043-44	TOTAL 2045-46	TOTAL 2047-48	TOTAL 2049-50	TOTAL 2051-52	TOTAL 2053-54	TOTAL 2055-56	TOTAL 2057-58	TOTAL 2059-60	TOTAL 2061-62	TOTAL 2063-64	TOTAL 2065-66	TOTAL 2067-68	TOTAL 2069-70	TOTAL 2071-72	TOTAL 2073-74	TOTAL 2075-76	TOTAL 2077-78	TOTAL 2079-80	TOTAL 2081-82	TOTAL 2083-84	TOTAL 2085-86	TOTAL 2087-88	TOTAL 2089-90	TOTAL 2091-92	TOTAL 2093-94	TOTAL 2095-96	TOTAL 2097-98	TOTAL 2099-00	TOTAL 2101-02	TOTAL 2103-04	TOTAL 2105-06	TOTAL 2107-08	TOTAL 2109-10	TOTAL 2111-12	TOTAL 2113-14	TOTAL 2115-16	TOTAL 2117-18	TOTAL 2119-20	TOTAL 2121-22	TOTAL 2123-24	TOTAL 2125-26	TOTAL 2127-28	TOTAL 2129-30	TOTAL 2131-32	TOTAL 2133-34	TOTAL 2135-36	TOTAL 2137-38	TOTAL 2139-40	TOTAL 2141-42	TOTAL 2143-44	TOTAL 2145-46	TOTAL 2147-48	TOTAL 2149-50	TOTAL 2151-52	TOTAL 2153-54	TOTAL 2155-56	TOTAL 2157-58	TOTAL 2159-60	TOTAL 2161-62	TOTAL 2163-64	TOTAL 2165-66	TOTAL 2167-68	TOTAL 2169-70	TOTAL 2171-72	TOTAL 2173-74	TOTAL 2175-76	TOTAL 2177-78	TOTAL 2179-80	TOTAL 2181-82	TOTAL 2183-84	TOTAL 2185-86	TOTAL 2187-88	TOTAL 2189-90	TOTAL 2191-92	TOTAL 2193-94	TOTAL 2195-96	TOTAL 2197-98	TOTAL 2199-00	TOTAL 2201-02	TOTAL 2203-04	TOTAL 2205-06	TOTAL 2207-08	TOTAL 2209-10	TOTAL 2211-12	TOTAL 2213-14	TOTAL 2215-16	TOTAL 2217-18	TOTAL 2219-20	TOTAL 2221-22	TOTAL 2223-24	TOTAL 2225-26	TOTAL 2227-28	TOTAL 2229-30	TOTAL 2231-32	TOTAL 2233-34	TOTAL 2235-36	TOTAL 2237-38	TOTAL 2239-40	TOTAL 2241-42	TOTAL 2243-44	TOTAL 2245-46	TOTAL 2247-48	TOTAL 2249-50	TOTAL 2251-52	TOTAL 2253-54	TOTAL 2255-56	TOTAL 2257-58	TOTAL 2259-60	TOTAL 2261-62	TOTAL 2263-64	TOTAL 2265-66	TOTAL 2267-68	TOTAL 2269-70	TOTAL 2271-72	TOTAL 2273-74	TOTAL 2275-76	TOTAL 2277-78	TOTAL 2279-80	TOTAL 2281-82	TOTAL 2283-84	TOTAL 2285-86	TOTAL 2287-88	TOTAL 2289-90	TOTAL 2291-92	TOTAL 2293-94	TOTAL 2295-96	TOTAL 2297-98	TOTAL 2299-00	TOTAL 2301-02	TOTAL 2303-04	TOTAL 2305-06	TOTAL 2307-08	TOTAL 2309-10	TOTAL 2311-12	TOTAL 2313-14	TOTAL 2315-16	TOTAL 2317-18	TOTAL 2319-20	TOTAL 2321-22	TOTAL 2323-24	TOTAL 2325-26	TOTAL 2327-28	TOTAL 2329-30	TOTAL 2331-32	TOTAL 2333-34	TOTAL 2335-36	TOTAL 2337-38	TOTAL 2339-40	TOTAL 2341-42	TOTAL 2343-44	TOTAL 2345-46	TOTAL 2347-48	TOTAL 2349-50	TOTAL 2351-52	TOTAL 2353-54	TOTAL 2355-56	TOTAL 2357-58	TOTAL 2359-60	TOTAL 2361-62	TOTAL 2363-64	TOTAL 2365-66	TOTAL 2367-68	TOTAL 2369-70	TOTAL 2371-72	TOTAL 2373-74	TOTAL 2375-76	TOTAL 2377-78	TOTAL 2379-80	TOTAL 2381-82	TOTAL 2383-84	TOTAL 2385-86	TOTAL 2387-88	TOTAL 2389-90	TOTAL 2391-92	TOTAL 2393-94	TOTAL 2395-96	TOTAL 2397-98	TOTAL 2399-00	TOTAL 2401-02	TOTAL 2403-04	TOTAL 2405-06	TOTAL 2407-08	TOTAL 2409-10	TOTAL 2411-12	TOTAL 2413-14	TOTAL 2415-16	TOTAL 2417-18	TOTAL 2419-20	TOTAL 2421-22	TOTAL 2423-24	TOTAL 2425-26	TOTAL 2427-28	TOTAL 2429-30	TOTAL 2431-32	TOTAL 2433-34	TOTAL 2435-36	TOTAL 2437-38	TOTAL 2439-40	TOTAL 2441-42	TOTAL 2443-44	TOTAL 2445-46	TOTAL 2447-48	TOTAL 2449-50	TOTAL 2451-52	TOTAL 2453-54	TOTAL 2455-56	TOTAL 2457-58	TOTAL 2459-60	TOTAL 2461-62	TOTAL 2463-64	TOTAL 2465-66	TOTAL 2467-68	TOTAL 2469-70	TOTAL 2471-72	TOTAL 2473-74	TOTAL 2475-76	TOTAL 2477-78	TOTAL 2479-80	TOTAL 2481-82	TOTAL 2483-84	TOTAL 2485-86	TOTAL 2487-88	TOTAL 2489-90	TOTAL 2491-92	TOTAL 2493-94	TOTAL 2495-96	TOTAL 2497-98	TOTAL 2499-00	TOTAL 2501-02	TOTAL 2503-04	TOTAL 2505-06	TOTAL 2507-08	TOTAL 2509-10	TOTAL 2511-12	TOTAL 2513-14	TOTAL 2515-16	TOTAL 2517-18	TOTAL 2519-20	TOTAL 2521-22	TOTAL 2523-24	TOTAL 2525-26	TOTAL 2527-28	TOTAL 2529-30	TOTAL 2531-32	TOTAL 2533-34	TOTAL 2535-36	TOTAL 2537-38	TOTAL 2539-40	TOTAL 2541-42	TOTAL 2543-44	TOTAL 2545-46	TOTAL 2547-48	TOTAL 2549-50	TOTAL 2551-52	TOTAL 2553-54	TOTAL 2555-56	TOTAL 2557-58	TOTAL 2559-60	TOTAL 2561-62	TOTAL 2563-64	TOTAL 2565-66	TOTAL 2567-68	TOTAL 2569-70	TOTAL 2571-72	TOTAL 2573-74	TOTAL 2575-76	TOTAL 2577-78	TOTAL 2579-80	TOTAL 2581-82	TOTAL 2583-84	TOTAL 2585-86	TOTAL 2587-88	TOTAL 2589-90	TOTAL 2591-92	TOTAL 2593-94	TOTAL 2595-96	TOTAL 2597-98	TOTAL 2599-00	TOTAL 2601-02	TOTAL 2603-04	TOTAL 2605-06	TOTAL 2607-08	TOTAL 2609-10	TOTAL 2611-12	TOTAL 2613-14	TOTAL 2615-16	TOTAL 2617-18	TOTAL 2619-20	TOTAL 2621-22	TOTAL 2623-24	TOTAL 2625-26	TOTAL 2627-28	TOTAL 2629-30	TOTAL 2631-32	TOTAL 2633-34	TOTAL 2635-36	TOTAL 2637-38	TOTAL 2639-40	TOTAL 2641-42	TOTAL 2643-44	TOTAL 2645-46	TOTAL 2647-48	TOTAL 2649-50	TOTAL 2651-52	TOTAL 2653-54	TOTAL 2655-56	TOTAL 2657-58	TOTAL 2659-60	TOTAL 2661-62	TOTAL 2663-64	TOTAL 2665-66	TOTAL 2667-68	TOTAL 2669-70	TOTAL 2671-72	TOTAL 2673-74	TOTAL 2675-76	TOTAL 2677-78	TOTAL 2679-80	TOTAL 2681-82	TOTAL 2683-84	TOTAL 2685-86	TOTAL 2687-88	TOTAL 2689-90	TOTAL 2691-92	TOTAL 2693-94	TOTAL 2695-96	TOTAL 2697-98	TOTAL 2699-00	TOTAL 2701-02	TOTAL 2703-04	TOTAL 2705-06	TOTAL 2707-08	TOTAL 2709-10	TOTAL 2711-12	TOTAL 2713-14	TOTAL 2715-16	TOTAL 2717-18	TOTAL 2719-20	TOTAL 2721-22	TOTAL 2723-24	TOTAL 2725-26	TOTAL 2727-28	TOTAL 2729-30	TOTAL 2731-32	TOTAL 2733-34	TOTAL 2735-36	TOTAL 2737-38	TOTAL 2739-40	TOTAL 2741-42	TOTAL 2743-44	TOTAL 2745-46	TOTAL 2747-48	TOTAL 2749-50	TOTAL 2751-52	TOTAL 2753-54	TOTAL 2755-56	TOTAL 2757-58	TOTAL 2759-60	TOTAL 2761-62	TOTAL 2763-64	TOTAL 2765-66	TOTAL 2767-68	TOTAL 2769-70	TOTAL 2771-72	TOTAL 2773-74	TOTAL 2775-76	TOTAL 2777-78	TOTAL 2779-80	TOTAL 2781-82	TOTAL 2783-84	TOTAL 2785-86	TOTAL 2787-88	TOTAL 2789-90	TOTAL 2791-92	TOTAL 2793-94	TOTAL 2795-96	TOTAL 2797-98	TOTAL 2799-00	TOTAL 2801-02	TOTAL 2803-04	TOTAL 2805-06	TOTAL 2807-08	TOTAL 2809-10	TOTAL 2811-12	TOTAL 2813-14	TOTAL 2815-16	TOTAL 2817-18	TOTAL 2819-20	TOTAL 2821-22	TOTAL 2823-24	TOTAL 2825-26	TOTAL 2827-28	TOTAL 2829-30	TOTAL 2831-32	TOTAL 2833-34	TOTAL 2835-36	TOTAL 2837-38	TOTAL 2839-40	TOTAL 2841-42	TOTAL 2843-44	TOTAL 2845-46	TOTAL 2847-48	TOTAL 2849-50	TOTAL 2851-52	TOTAL 2853-54	TOTAL 2855-56	TOTAL 2857-58	TOTAL 2859-60	TOTAL 2861-62	TOTAL 2863-64	TOTAL 2865-66	TOTAL 2867-68	TOTAL 2869-70	TOTAL 2871-72	TOTAL 2873-74	TOTAL 2875-76	TOTAL 2877-78	TOTAL 2879-80	TOTAL 2881-82	TOTAL 2883-84	TOTAL 2885-86	TOTAL 2887-88	TOTAL 2889-90	TOTAL 2891-92	TOTAL 2893-94	TOTAL 2895-96	TOTAL 2897-98	TOTAL 2899-00	TOTAL 2901-02	TOTAL 2903-04	TOTAL 2905-06	TOTAL 2907-08	TOTAL 2909-10	TOTAL 2911-12	TOTAL 2913-14	TOTAL 2915-16	TOTAL 2917-18	TOTAL 2919-20	TOTAL 2921-22	TOTAL 2923-24	TOTAL 2925-26	TOTAL 2927-28	TOTAL 2929-30	TOTAL 2931-32	TOTAL 2933-34	TOTAL 2935-36	TOTAL 2937-38	TOTAL 2939-40	TOTAL 2941-42	TOTAL 2943-44	TOTAL 2945-46	TOTAL 2947-48	TOTAL 2949-50	TOTAL 2951-52	TOTAL 2953-54	TOTAL 2955-56	TOTAL 2957-58	TOTAL 2959-60	TOTAL 2961-62	TOTAL 2963-64	TOTAL 2965-66	TOTAL 2967-68	TOTAL 2969-70	TOTAL 2971-72	TOTAL 2973-74	TOTAL 2975-76	TOTAL 2977-78	TOTAL 2979-80	TOTAL 2981-82	TOTAL 2983-84	TOTAL 2985-86	TOTAL 2987-88	TOTAL 2989-90	TOTAL 2991-92	TOTAL 2993-94	TOTAL 2995-96	TOTAL 2997-98	TOTAL 2999-00	TOTAL 3001-02	TOTAL 3003-04	TOTAL 3005-06	TOTAL 3007-08	TOTAL 3009-10	TOTAL 3011-12	TOTAL 3013-14	TOTAL 3015-16	TOTAL 3017-18	TOTAL 3019-20	TOTAL 3021-22	TOTAL 3023-24	TOTAL 3025-26	TOTAL 3027-28	TOTAL 3029-30	TOTAL 3031-32	TOTAL 3033-34	TOTAL 3035-36	TOTAL 3037-38	TOTAL 3039-40	TOTAL 3041-42	TOTAL 3043-44	TOTAL 3045-46	TOTAL 3047-48	TOTAL 3049-50	TOTAL 3051-52	TOTAL 3053-54	TOTAL 3055-56	TOTAL 3057-58	TOTAL 3059-60	TOTAL 3061-62	TOTAL 3063-64	TOTAL 3065-66	TOTAL 3067-68	TOTAL 3069-70	TOTAL 3071-72	TOTAL 3073-74	TOTAL 3075-76	TOTAL 3077-78	TOTAL 3079-80	TOTAL 3081-82	TOTAL 3083-84	TOTAL 3085-86	TOTAL 3087-88	TOTAL 3089-90	TOTAL 3091-92	TOTAL 3093-94	TOTAL 3095-96	TOTAL 3097-98	TOTAL 3099-00	TOTAL 3101-02	TOTAL 3103-04	TOTAL 3105-06	TOTAL 3107-08	TOTAL 3109-10	TOTAL 3111-12	TOTAL 3113-14	TOTAL 3115-16	TOTAL 3117-18	TOTAL 3119-20	TOTAL 3121-22	TOTAL 3123-24	TOTAL 3125-26	TOTAL 3127-28	TOTAL 3129-30	TOTAL 3131-32	TOTAL 3133-34	TOTAL 3135-36	TOTAL 3137-38	TOTAL 3139-40	TOTAL 3141-42	TOTAL 3143-44	TOTAL 3145-46	TOTAL 3147-48	TOTAL 3149-50	TOTAL 3151-52	TOTAL 3153-54	TOTAL 3155-56	TOTAL 3157-58	TOTAL 3159-60	TOTAL 3161-62	TOTAL 3163-64	TOTAL 3165-66	TOTAL 3167-68	TOTAL 3169-70	TOTAL 3171-72	TOTAL 3173-74	TOTAL 3175-76	TOTAL 3177-78	TOTAL 3179-80	TOTAL 3181-82	TOTAL 3183-84	TOTAL 3185-86	TOTAL 3187-88	TOTAL 3189-90	TOTAL 3191-92	TOTAL 3193-94	TOTAL 3195-96	TOTAL 3197-98	TOTAL 3199-00	TOTAL 3201-02	TOTAL 3203-04	TOTAL 3205-06	TOTAL 3207-08	TOTAL 3209-10	TOTAL 3211-12	TOTAL 3213-14	TOTAL 3215-16	TOTAL 3217-18	TOTAL 3219-20	TOTAL 3221-22	TOTAL 3223-24	TOTAL 3225-26	TOTAL 3227-28	TOTAL 3229-30	TOTAL 3231-32	TOTAL 3233-34	TOTAL 3235-36	TOTAL 3237-38	TOTAL 3239-40	TOTAL 3241-42	TOTAL 3243-44	TOTAL 3245-46	TOTAL 3247-48	TOTAL 3249-50	TOTAL 3251-52	TOTAL 3253-54	TOTAL 3255-56	TOTAL 3257-58	TOTAL 3259-60	TOTAL 3261-62	TOTAL 3263-64	TOTAL 3265-66	TOTAL 3267-68	TOTAL 3269-70	TOTAL 3271-72	TOTAL 3273-74	TOTAL 3275-76	TOTAL 3277-78	TOTAL 3279-80	TOTAL 3281-82	TOTAL 3283-84	TOTAL 3285-86	TOTAL 3287-88	TOTAL 3289-90	TOTAL 3291-92	TOTAL 3293-94	TOTAL 3295-96	TOTAL 3297-98	TOTAL 3299-00	TOTAL 3301-02	TOTAL 3303-04	TOTAL 3305-06	TOTAL 3307-08	TOTAL 3309-10	TOTAL 3311-12	TOTAL 3313-14	TOTAL 3315-16	TOTAL 3317-18	TOTAL 3319-20	TOTAL 3321-22	TOTAL 3323-24	TOTAL 3325-26	TOTAL 3327-28	TOTAL 3329-30	TOTAL 3331-32	TOTAL 3333-34	TOTAL 3335-36	TOTAL 3337-38	TOTAL
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TABLE 1.2-1. Energy Consumption: Per Capita and Goals for FY 80: FY 80-81

		1975	1980	1985
a.	Electricity			
b.	Coal			
c.	Yard Oil 0.2	56,210	74,910	37,413
d.	Yard Oil 0.6	44,741	50,640	60,213
e.	Yard Oil 0.8	200,866	163,734	100,000
f.	Yard Oil 1.0	47,010	01,432	1,742
g.	Yard Oil 1.2			
h.	Yard Oil 1.4	358,815	310,152	-
i.	Yard Oil 1.6			
j.	Yard Oil 1.8			
k.	Yard Oil 2.0			
l.	Yard Oil 2.2			
m.	Yard Oil 2.4			
n.	Yard Oil 2.6			
o.	Yard Oil 2.8			
p.	Yard Oil 3.0			
q.	Yard Oil 3.2			
r.	Yard Oil 3.4			
s.	Yard Oil 3.6			
t.	Yard Oil 3.8			
u.	Yard Oil 4.0			
v.	Yard Oil 4.2			
w.	Yard Oil 4.4			
x.	Yard Oil 4.6			
y.	Yard Oil 4.8			
z.	Yard Oil 5.0			
aa.	Yard Oil 5.2			
ab.	Yard Oil 5.4			
ac.	Yard Oil 5.6			
ad.	Yard Oil 5.8			
ae.	Yard Oil 6.0			
af.	Yard Oil 6.2			
ag.	Yard Oil 6.4			
ah.	Yard Oil 6.6			
ai.	Yard Oil 6.8			
aj.	Yard Oil 7.0			
ak.	Yard Oil 7.2			
al.	Yard Oil 7.4			
am.	Yard Oil 7.6			
an.	Yard Oil 7.8			
ao.	Yard Oil 8.0			
ap.	Yard Oil 8.2			
aq.	Yard Oil 8.4			
ar.	Yard Oil 8.6			
as.	Yard Oil 8.8			
at.	Yard Oil 9.0			
au.	Yard Oil 9.2			
av.	Yard Oil 9.4			
aw.	Yard Oil 9.6			
ax.	Yard Oil 9.8			
ay.	Yard Oil 10.0			
az.	Yard Oil 10.2			
ba.	Yard Oil 10.4			
bb.	Yard Oil 10.6			
bc.	Yard Oil 10.8			
bd.	Yard Oil 11.0			
be.	Yard Oil 11.2			
bf.	Yard Oil 11.4			
bg.	Yard Oil 11.6			
bh.	Yard Oil 11.8			
bi.	Yard Oil 12.0			
bj.	Yard Oil 12.2			
bk.	Yard Oil 12.4			
bl.	Yard Oil 12.6			
bm.	Yard Oil 12.8			
bn.	Yard Oil 13.0			
bo.	Yard Oil 13.2			
bp.	Yard Oil 13.4			
bq.	Yard Oil 13.6			
br.	Yard Oil 13.8			
bs.	Yard Oil 14.0			
bt.	Yard Oil 14.2			
bu.	Yard Oil 14.4			
bv.	Yard Oil 14.6			
bw.	Yard Oil 14.8			
bx.	Yard Oil 15.0			
by.	Yard Oil 15.2			
bz.	Yard Oil 15.4			
ca.	Yard Oil 15.6			
cb.	Yard Oil 15.8			
cc.	Yard Oil 16.0			
cd.	Yard Oil 16.2			
ce.	Yard Oil 16.4			
cf.	Yard Oil 16.6			
cg.	Yard Oil 16.8			
ch.	Yard Oil 17.0			
ci.	Yard Oil 17.2			
cj.	Yard Oil 17.4			
ck.	Yard Oil 17.6			
cl.	Yard Oil 17.8			
cm.	Yard Oil 18.0			
cn.	Yard Oil 18.2			
co.	Yard Oil 18.4			
cp.	Yard Oil 18.6			
cq.	Yard Oil 18.8			
cr.	Yard Oil 19.0			
cs.	Yard Oil 19.2			
ct.	Yard Oil 19.4			
cu.	Yard Oil 19.6			
cv.	Yard Oil 19.8			
cw.	Yard Oil 20.0			
cx.	Yard Oil 20.2			
cy.	Yard Oil 20.4			
cz.	Yard Oil 20.6			
da.	Yard Oil 20.8			
db.	Yard Oil 21.0			
dc.	Yard Oil 21.2			
dd.	Yard Oil 21.4			
de.	Yard Oil 21.6			
df.	Yard Oil 21.8			
dg.	Yard Oil 22.0			
dh.	Yard Oil 22.2			
di.	Yard Oil 22.4			
dj.	Yard Oil 22.6			
dk.	Yard Oil 22.8			
dl.	Yard Oil 23.0			
dm.	Yard Oil 23.2			
dn.	Yard Oil 23.4			
do.	Yard Oil 23.6			
dp.	Yard Oil 23.8			
dq.	Yard Oil 24.0			
dr.	Yard Oil 24.2			
ds.	Yard Oil 24.4			
dt.	Yard Oil 24.6			
du.	Yard Oil 24.8			
dv.	Yard Oil 25.0			
dw.	Yard Oil 25.2			
dx.	Yard Oil 25.4			
dy.	Yard Oil 25.6			
dz.	Yard Oil 25.8			
ea.	Yard Oil 26.0			
eb.	Yard Oil 26.2			
ec.	Yard Oil 26.4			
ed.	Yard Oil 26.6			
ee.	Yard Oil 26.8			
ef.	Yard Oil 27.0			
eg.	Yard Oil 27.2			
eh.	Yard Oil 27.4			
ei.	Yard Oil 27.6			
ej.	Yard Oil 27.8			
ek.	Yard Oil 28.0			
el.	Yard Oil 28.2			
em.	Yard Oil 28.4			
en.	Yard Oil 28.6			
eo.	Yard Oil 28.8			
ep.	Yard Oil 29.0			
eq.	Yard Oil 29.2			
er.	Yard Oil 29.4			
es.	Yard Oil 29.6			
et.	Yard Oil 29.8			
eu.	Yard Oil 30.0			
ev.	Yard Oil 30.2			
ew.	Yard Oil 30.4			
ex.	Yard Oil 30.6			
ey.	Yard Oil 30.8			
ez.	Yard Oil 31.0			
fa.	Yard Oil 31.2			
fb.	Yard Oil 31.4			
fc.	Yard Oil 31.6			
fd.	Yard Oil 31.8			
fe.	Yard Oil 32.0			
ff.	Yard Oil 32.2			
fg.	Yard Oil 32.4			
fh.	Yard Oil 32.6			
fi.	Yard Oil 32.8			
fj.	Yard Oil 33.0			
fk.	Yard Oil 33.2			
fl.	Yard Oil 33.4			
fm.	Yard Oil 33.6			
fn.	Yard Oil 33.8			
fo.	Yard Oil 34.0			
fp.	Yard Oil 34.2			
fq.	Yard Oil 34.4			
fr.	Yard Oil 34.6			
fs.	Yard Oil 34.8			
ft.	Yard Oil 35.0			
fu.	Yard Oil 35.2			
fv.	Yard Oil 35.4			
fw.	Yard Oil 35.6			
fx.	Yard Oil 35.8			
fy.	Yard Oil 36.0			
fz.	Yard Oil 36.2			
ga.	Yard Oil 36.4			
gb.	Yard Oil 36.6			
gc.	Yard Oil 36.8			
gd.	Yard Oil 37.0			
ge.	Yard Oil 37.2			
gf.	Yard Oil 37.4			
gh.	Yard Oil 37.6			
gi.	Yard Oil 37.8			
gj.	Yard Oil 38.0			
gk.	Yard Oil 38.2			
gl.	Yard Oil 38.4			
gm.	Yard Oil 38.6			
gn.	Yard Oil 38.8			
go.	Yard Oil 39.0			
gp.	Yard Oil 39.2			
gq.	Yard Oil 39.4			
gr.	Yard Oil 39.6			
gs.	Yard Oil 39.8			
gt.	Yard Oil 40.0			
gu.	Yard Oil 40.2			
gv.	Yard Oil 40.4			
gw.	Yard Oil 40.6			
gx.	Yard Oil 40.8			
gy.	Yard Oil 41.0			
gz.	Yard Oil 41.2			
ha.	Yard Oil 41.4			
hb.	Yard Oil 41.6			
hc.	Yard Oil 41.8			
hd.	Yard Oil 42.0			
he.	Yard Oil 42.2			
hf.	Yard Oil 42.4			
hg.	Yard Oil 42.6			
hi.	Yard Oil 42.8			
hj.	Yard Oil 43.0			
hk.	Yard Oil 43.2			
hl.	Yard Oil 43.4			
hm.	Yard Oil 43.6			
hn.	Yard Oil 43.8			
ho.	Yard Oil 44.0			
hp.	Yard Oil 44.2			
hq.	Yard Oil 44.4			
hr.	Yard Oil 44.6			
hs.	Yard Oil 44.8			
ht.	Yard Oil 45.0			
hu.	Yard Oil 45.2			
hv.	Yard Oil 45.4			
hw.	Yard Oil 45.6			
hx.	Yard Oil 45.8			
hy.	Yard Oil 46.0			
hz.	Yard Oil 46.2			
ia.	Yard Oil 46.4			
ib.	Yard Oil 46.6			
ic.	Yard Oil 46.8			
id.	Yard Oil 47.0			
ie.	Yard Oil 47.2			
if.	Yard Oil 47.4			
ig.	Yard Oil 47.6			
ih.	Yard Oil 47.8			
ii.	Yard Oil 48.0			
ij.	Yard Oil 48.2			
ik.	Yard Oil 48.4			
il.	Yard Oil 48.6			
im.	Yard Oil 48.8			
in.	Yard Oil 49.0			
io.	Yard Oil 49.2			
ip.	Yard Oil 49.4			
iq.	Yard Oil 49.6			
ir.	Yard Oil 49.8			
is.	Yard Oil 50.0			
it.	Yard Oil 50.2			
iu.	Yard Oil 50.4			
iv.	Yard Oil 50.6			
iw.	Yard Oil 50.8			
ix.	Yard Oil 51.0			
iy.	Yard Oil 51.2			
iz.	Yard Oil 51.4			
ja.	Yard Oil 51.6			
jb.	Yard Oil 51.8			
jc.	Yard Oil 52.0			
jd.	Yard Oil 52.2			
je.	Yard Oil 52.4			
jf.	Yard Oil 52.6			
hg.	Yard Oil 52.8			
jh.	Yard Oil 53.0			
ji.	Yard Oil 53.2			
jj.	Yard Oil 53.4			
jk.	Yard Oil 53.6			
jl.	Yard Oil 53.8			
jm.	Yard Oil 54.0			
jn.	Yard Oil 54.2			
jo.	Yard Oil 54.4			
jp.	Yard Oil 54.6			
jq.	Yard Oil 54.8			
jr.	Yard Oil 55.0			
js.	Yard Oil 55.2			
jt.	Yard Oil 55.4			
ju.	Yard Oil 55.6			
jv.	Yard Oil 55.8			
jw.	Yard Oil 56.0			
jx.	Yard Oil 56.2			
iy.	Yard Oil 56.4			
iz.	Yard Oil 56.6			
ka.	Yard Oil 56.8			
kb.	Yard Oil 57.0			
kc.	Yard Oil 57.2			
kd.	Yard Oil 57.4			
ke.	Yard Oil 57.6			
kf.	Yard Oil 57.8			
kg.	Yard Oil 58.0			
kh.	Yard Oil 58.2			
ki.	Yard Oil 58.4			
kl.	Yard Oil 58.6			
km.	Yard Oil 58.8			
kn.	Yard Oil 59.0			
ko.	Yard Oil 59.2			
kp.	Yard Oil 59.4			
kq.	Yard Oil 59.6			
kr.	Yard Oil 59.8			
ks.	Yard Oil 60.0			
kt.	Yard Oil 60.2			
ku.	Yard Oil 60.4			
kv.	Yard Oil 60.6			
kw.	Yard Oil 60.8			
kx.	Yard Oil 61.0			
ky.	Yard Oil 61.2			
kz.	Yard Oil 61.4			
la.	Yard Oil 61.6			
lb.	Yard Oil 61.8			
lc.	Yard Oil 62.0			
ld.	Yard Oil 62.2			
le.	Yard Oil 62.4			
lf.	Yard Oil 62.6			
lg.	Yard Oil 62.8			
lh.	Yard Oil 63.0			
li.	Yard Oil 63.2			
lj.	Yard Oil 63.4			
lk.	Yard Oil 63.6			
ll.	Yard Oil 63.8			
lm.	Yard Oil 64.0			
ln.	Yard Oil 64.2			
lo.	Yard Oil 64.4			
lp.	Yard Oil 64.6			
lq.	Yard Oil 64.8			
lr.	Yard Oil 65.0			
ls.	Yard Oil 65.2			
lt.	Yard Oil 65.4			
lu.	Yard Oil 65.6			
lv.	Yard Oil 65.8			
lw				

TABLE 3.4
VILSECK TYPICAL BUILDING
ENERGY CONSUMPTION

<u>TYPE</u>	<u>No.</u>	<u>DESCRIPTION</u>	<u>MBTU/YR</u>	
			<u>ELEC</u>	<u>FUEL</u>
1	252	EM BARRACKS WO/MESS	237	2895
2	152	HUTMENTS	9	345
3	161	EM MESS	159	1285
5	433	FAMILY HOUSING	350	1025
6	429	FAMILY HOUSING (NEW)	623	1352
7	480	DEPENDENT GRADE SCHOOL	442	2690
9	354	THEATER	436	2644
10	322	LAUNDRY	642	2392
11	308	MOTOR/TANK REPAIR	975	9145
12	323	GYMNASIUM	456	7487
13	218	CHAPEL	169	1003
14	215	BOWLING	493	2008
15	217	RETAIL STORE/COMMISARY	1215	2865
16	265	ADMINISTRATION	95	1209
17	345	APPLIED INSTRUCTION	170	1783
18	134	STOREHOUSE/WAREHOUSE	231	1685
19	133	OPEN MESS/NCO	1261	2976
20	201	FIRE STATION	363	977
21	301	DISPENSARY	253	1403
22	422	TELEPHONE EXCHANGE	653	864
24	840	FAMILY HOUSING (OFF BASE)	170	3009

8.

DATA COLLECTED BY BUILDING SURVEY AND SELECTION OF
REPRESENTATIVE BUILDINGS (INCREMENTS A & G ONLY)

The following data has been presented in detail in the
Energy report and was originally presented in the
Preliminary Submittal:

Building Envelope Construction Data.

Occupancy, Lighting, Equipment and DHW Data.

Terminal Heating Systems and Control Data.

Primary Heating Systems Data.

Possible Energy Conservation Opportunities.

We have presented in the following table an updated
list of representative buildings of each type selected
for detailed Energy Conservation Analysis. In some
types, we have selected more than one building for
analysis in order to obtain more realistic basewide
extrapolated ECIP or CMA projects.

Table 4.8
REPRESENTATIVE BUILDINGS OF EACH TYPE
VILSECK

TYPE	BUILDING TYPE DESCRIPTION	BUILDING
1	EM BARRACKS W/O MESS, BOQ	252
2	HUTMENTS	152
3	EM MESS	161
5	FAMILY HOUSING	433
6	FAMILY HOUSING (NEW)	429
7	DEPENDENT GRADE SCHOOL	480
9	THEATRE	354
10	LAUNDRY	322
11	MOTOR/TANK REPAIR SHOP	205, 308
12	GYMNASIUM	323
13	CHAPEL	218
14	BOWLING CENTER	215
15	RETAIL STORE/COMMISSARY	217
16	ADMINISTRATION	265
17	APPLIED INSTRUCTION	343, 349
18	STOREHOUSE/WAREHOUSE	134
19	OPEN MESS NCO/CLUB	133
20	FIRE STATION	201
21	DISPENSARY	301
22	TELEPHONE EXCHANGE	422
24	FAMILY HOUSING (OFF-BASE)	840